Walter Chandoha

The Beauty of Horses contributes to their great popularity. The powerful bodies and flowing manes and tails of the Arabian horses shown above give the animals a noble appearance.

HORSE

HORSE has been one of the most useful animals for thousands of years. Horses once provided the fastest and surest way to travel on land. Hunters on horseback chased animals and killed them for food or for sport. Soldiers charged into battle on sturdy war horses. The pioneers used horses when they settled the American West in the days of stagecoaches, covered wagons, and the pony express.

The horse is not as important as a means of transportation as it once was. In most countries, the *iron horse* (train) and *horseless carriage* (automobile) have replaced the horse almost entirely. But people still use horses for recreation, sport, and work. Children and adults ride horses for fun and exercise. Large crowds thrill to the excitement of horse races. Horses perform in circuses, rodeos, carnivals, parades, and horse shows. They help ranchers round up great herds of cattle, and they may be used to pull plows and do other farm work.

The horse is well-suited for working and running. For example, its wide nostrils help it breathe easily. Horses have a good sense of smell, sharp ears, and keen eyes. They have strong teeth, but they eat only grain and plants, never meat. Long, muscular legs give horses the strength to pull heavy loads or to run at fast speeds. Horses also use their legs as their chief weapons. The kick of a horse can seriously injure a human being or an animal.

Horses are eager to please their owners or trainers. Most horses have good memories and can easily be trained to obey commands. A horse may learn to come when its owner whistles. A circus horse takes "bows" when its trainer touches its front legs with a whip. Horses can learn to respond to even the slightest signals. People who watch an expert rider on a well-trained horse often cannot see these signs. For example, the horse moves forward when the rider's legs are pressed lightly against the horse's side. It turns at a touch of the reins against its neck. The quick obedience of the horse has helped make it one of our most valuable animals.

People have improved the natural qualities of the horse by breeding various kinds of horses. For example, horse raisers can breed a fast horse with a strong horse to produce an animal that has both speed and power.

The contributors of this article are Steven D. Price, author of Panorama of American Horses *and other books about horses; and Bill Landsman, president of Bill Landsman Associates, Inc.*

Horney was born Karen Danielsen in Hamburg. She married Oscar Horney, a Berlin attorney, in 1909. She received her M.D. degree from the University of Berlin in 1913. In 1932, Horney moved to the United States. She helped form the American Institute for Psychoanalysis in 1941 and served as its dean until her death. Her major works include *The Neurotic Personality of Our Time* (1937), *Self-Analysis* (1942), and *Our Inner Conflicts* (1945). GEORGE H. POLLOCK

HORNPIPE is a lively dance done by sailors to the music of a small wooden pipe having holes and a reed mouthpiece. The pipe itself was called a hornpipe.

HORNSBY, ROGERS (1896-1963), an American baseball player, is often called the greatest right-handed hitter of all time. Nicknamed *Rajah*, he won seven National League batting titles and had a .358 lifetime batting average. Only Ty Cobb, with .367, had a higher average. Hornsby batted .424 in 1924, a single season record.

A second baseman, he played for the St. Louis Cardinals from 1915 to 1926 and again in 1933; the New York Giants in 1927; the Boston Braves in 1928; the Chicago Cubs from 1929 to 1932; and the St. Louis Browns from 1933 to 1937. He also managed the Cardinals, Braves, Cubs, Browns, and Cincinnati Reds. Born in Winters, Tex., he was elected to the baseball Hall of Fame in 1942. JOSEPH P. SPOHN

HOROLOGY, *haw RAHL uh jee*, is the science of measuring time. It includes the design and construction of measuring devices, such as clocks and watches. Time was divided into years, months, weeks, and days long before any accurate measure was found for dividing the day. The hourglass was probably the first invention for marking the hours. See also TIME (Measuring Time); CLOCK and its Related Articles. ARTHUR B. SINKLER

HOROSCOPE is a chart that supposedly reveals a person's character or future. The chart shows the position of the earth, planets, and stars at a certain time, such as the time of a person's birth. *Astrologers* (persons who tell fortunes by studying the stars) believe that the position of these bodies influences a person's life. An astrologer *casts* (draws) a person's horoscope and explains its supposed meaning.

Most scientists would say that there is no scientific basis for a belief in horoscopes. Yet, many persons believe in horoscopes and base important decisions on advice they receive from astrologers. Others find it amusing just to read general advice published in newspaper "horoscope" columns.

Parts of a Horoscope. A horoscope has three main parts that represent three supposed influences on a person's life. The three parts are: (1) the zodiac, (2) the houses, and (3) the planets.

The Zodiac is a band of stars that appears to encircle the earth (see ZODIAC). The zodiac consists of 12 divisions called *signs*. Astrologers believe that a person comes under the special influence of a particular sign, depending on the date of the person's birth. For example, a person born from July 23 to August 23 has Leo as a zodiac sign and is often called "a Leo." Each zodiac sign has certain characteristics. For example, a Leo supposedly displays such characteristics as cheerfulness and pride.

The Houses represent imaginary divisions of the surface of the earth. Astrologers believe there are 12 houses, which are represented by 12 divisions of a person's horoscope. Each house supposedly influences a certain part of a person's life. The first house, for example, is associated with an individual's appearance and personality. Other houses affect a person's career, health, marriage, or some other interest.

The Planets, according to astrologers, include the moon and sun as well as Jupiter, Mars, Mercury, Neptune, Pluto, Saturn, Uranus, and Venus. The planets supposedly have an important influence on the houses and signs. A particular planet *rules* (most influences) each sign. This planet has certain characteristics that affect the sign it rules. For example, Mercury, which is associated with talkativeness and wittiness, rules Gemini. Therefore, persons born under the sign of Gemini are supposedly talkative and witty.

Astrologers also believe that the planets influence the activities or interests associated with individual houses. For example, if Venus (associated with beauty) were located in the first house (associated with appearance), an astrologer would conclude that the person had an attractive physical appearance.

The various planets in a person's chart lie at particular angles to one another. These angles, called *aspects*, also have meaning. Astrologers think that certain angles represent signs of good fortune. Others supposedly reveal approaching evil.

Explaining a Horoscope. A horoscope enables an astrologer to develop several kinds of character readings. Some horoscopes, for example, give only a general idea of an individual's character or future. Most of the horoscopes published in newspapers are of this type. They make predictions based only on the characteristics of the zodiac signs. Such a horoscope might tell persons born under the sign of Taurus simply that they face an important test in their career.

Astrologers may also cast a complete horoscope and study the complicated relationships formed by the houses, planets, and zodiac signs. For example, suppose that Saturn was located in the first house in the horoscope and in the sign of Virgo. An astrologer would probably conclude that the person was extremely neat both in manner of dress and habits. The astrologer would reach this conclusion because Saturn, a disciplined planet, is in the house of physical appearance and personality, under the sign of Virgo, which is associated with tidiness. CHRISTOPHER MCINTOSH

See also ASTROLOGY; HOUSE.

HOROWITZ, *HAW roh wits*, **VLADIMIR** (1904-), is an American pianist of Russian descent. He was born in Kiev, Russia, and at the age of six began to study piano with his mother. When he was 17, he graduated from the Kiev Conservatory. In 1923, he established a record in Leningrad by giving 23 concerts during one year. In 1928, he made his American debut with the New York Philharmonic Orchestra.

He remained in the United States. In 1933, he married Wanda Toscanini, daughter of the famous Italian conductor, Arturo Toscanini.

Horowitz retired from 1936 to 1940, and from 1953 to 1965. Each time he resumed his concert career. He combined great technical fluency with an almost orchestral approach to interpretation. ROBERT U. NELSON

There are more than 150 breeds and types of horses and ponies. The breeds vary greatly in size, strength, speed, and other characteristics. The smallest breed is the Fallabella, which grows only 30 inches (76 centimeters) high. Fallabellas were originally bred in Argentina and are kept as pets. The largest breed of horse is the Shire, which was originally developed in England. Shires may measure more than 68 inches (173 centimeters) high. They may weigh more than 2,000 pounds (910 kilograms).

Shires and other large breeds, such as the Belgian, Clydesdale, and Percheron, are the strongest horses. They can pull loads that weigh more than a short ton (0.9 metric ton). The two fastest breeds are the Quarter Horse and the Thoroughbred, which are often bred and trained for racing. The Quarter Horse can run ¼ mile (0.4 kilometer) in about 20 seconds. But the Thoroughbred can run longer distances faster. It can cover a mile (1.6 kilometers) in about 1½ minutes.

The various breeds of horses are commonly divided into three main groups: (1) light horses, (2) heavy horses, and (3) ponies. Light horses have small bones and thin legs. Most weigh less than 1,300 pounds (590 kilograms). Heavy horses have large bones and thick, sturdy legs. Some weigh more than 2,000 pounds (910 kilograms). Ponies are small horses that stand less than 58 inches (147 centimeters) high. Most ponies weigh less than 800 pounds (360 kilograms).

Each of the three main groups of horses has many breeds. However, a single breed may include horses of more than one type. For example, certain kinds of Hackneys are classified as light horses, and other kinds are considered ponies. In addition to light horses, heavy horses, and ponies, there are also a few kinds of wild horses.

Horse Terms

Bronco, or **Brone,** is any untamed western horse.

Colt, technically, is a male horse less than 4 years old. However, the word *colt* is often used for any young horse.

Crossbred means bred from a sire of one breed and a dam of another.

Dam is the mother of a foal.

Filly is a female horse less than 4 years old.

Foal is either a newborn male or a newborn female horse.

Frog is the elastic, horny, middle part of the sole of a horse's foot.

Gait is any forward movement of the horse, such as walking or galloping.

Gelding is a male horse that cannot be used for breeding because it has had some of its reproductive organs removed.

Grade is a horse or pony of mixed breed.

Mare is a female horse more than 4 years old.

Mustang is the wild horse of the western plains, descended from Spanish horses.

Pony is any small horse, but the word *pony* usually refers to a horse less than 58 inches (147 centimeters) tall when full-grown.

Purebred means bred from horses that are of the same breed.

Sire is the father of a foal.

Stallion is a male horse that can be used for breeding.

Yearling is a horse that is more than one and less than two years old. A race horse is considered a yearling from the first January 1 after its birth until the following January 1.

Some Types and Breeds of Horses

Type or Breed	Place of Origin	Weight in lbs.	Weight in kg	Height in Hands*
Saddle Horses				
American Saddle Horse	United States	900 to 1,200	410 to 540	14.3 to 16.1
American Quarter Horse	United States	900 to 1,200	410 to 540	14.2 to 15.3
Appaloosa	United States	950 to 1,175	430 to 530	14.2 to 15.2
Arabian	Arabia	850 to 1,000	390 to 450	14.2 to 15.3
Morgan	United States	800 to 1,100	360 to 500	14.2 to 15.2
Palomino	United States	900 to 1,300	410 to 590	14.1 to 16
Tennessee Walking Horse	United States	900 to 1,200	410 to 540	15 to 16
Thoroughbred	England	1,000 to 1,300	450 to 590	15 to 17
Light Harness or Roadster Horses				
Hackney	England	900 to 1,200	410 to 540	14.3 to 16.2
Standardbred or American Trotter	United States	800 to 1,200	360 to 540	15 to 16
Draft Horses				
Belgian	Belgium	1,700 to 2,200	770 to 1,000	16 to 19
Clydesdale	Scotland	1,500 to 2,000	680 to 910	16 to 17.1
Percheron	France	1,600 to 2,100	730 to 950	15 to 17
Shire	England	1,800 to 2,300	820 to 1,040	16 to 17
Suffolk	England	1,500 to 1,900	680 to 860	15.2 to 16.2
Heavy Harness or Coach Horses				
Cleveland Bay	England	1,250 to 1,550	570 to 700	15.3 to 16.3
French Coach	France	1,100 to 1,400	500 to 640	15.1 to 16.3
German Coach	Germany	1,200 to 1,500	540 to 680	15.2 to 16.3
Ponies				
Hackney Pony	England	600 to 850	270 to 390	12 to 14.2
Shetland Pony	Shetland Islands	300 to 500	140 to 230	9 to 11.2
Welsh Pony	Wales	400 to 650	180 to 290	10 to 12

*One hand equals 4 inches (10 centimeters)

Light Horses

Saddle Horses for riding make up an important group of breeds. Many persons ride horses for pleasure or raise them as a hobby. Some riders achieve great skill and compete with other riders in horse shows and sports involving horses.

The most popular breeds used for pleasure riding in the United States include the American Saddle Horse, Tennessee Walking Horse, Morgan, Quarter Horse, and Arabian. Southern plantation owners developed the American Saddle Horse and the Tennessee Walking Horse. The owners wanted mounts that were comfortable to ride. Tennessee Walking Horses are especially noted for their comfortable running walk and smooth canter. All Morgan horses can be traced back to a New England stallion named Justin Morgan (see MORGAN, JUSTIN). Morgans were originally used as harness horses for pulling carriages and for harness racing. After auto-

Fritz Prenzel, Bruce Coleman Inc.

American Saddle Horse

Tom Clark, Shostal

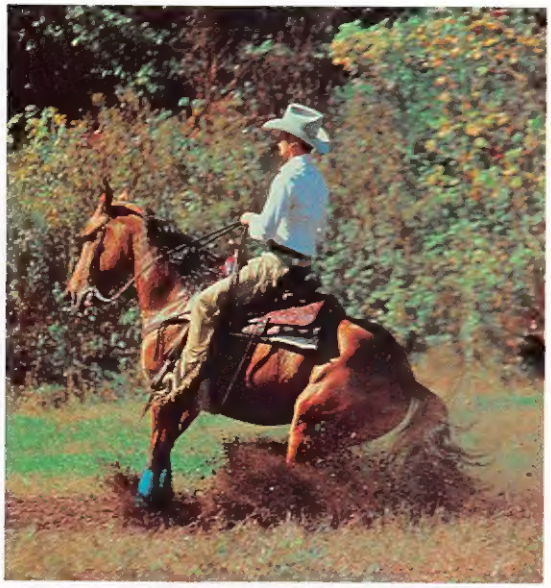
Tennessee Walking Horse

American Morgan Horse Assoc., Inc.

Morgan

WORLD BOOK photo

Arabian



Becky Hance

Quarter Horse

mobiles became popular, breeders developed Morgans into excellent saddle horses.

Cowhands use Quarter Horses for *cutting* (sorting out) cattle from a herd and for other ranch work. Quarter Horses can start, stop, and turn quickly. They respond instantly to the slightest shift of the cowhand's weight or movement of reins. These sure-footed horses have great endurance. They can scramble up and down steep mountain trails and ford swift streams.

Quarter Horses were developed in America during the early 1700's. Breeders crossed Thoroughbreds from England with horses from the Spanish colonies of North America. The new breed could start quickly and run at high speed for short distances. Owners used these horses for the sport of *quarter racing*, a $\frac{1}{4}$-mile (0.4-kilometer) race along a straight path.

The strong Arabian horse is noted for its endurance. Arabs developed this breed for use in the desert. For hundreds of years, breeders in many countries have brought these horses from Arabia and used them to develop new breeds.

One breed that developed from Arabian horses is the Thoroughbred. All Thoroughbreds can be traced back to three stallions named Darley Arabian, Godolphin Barb (sometimes called Godolphin Arabian), and By-

Alix Coleman

Thoroughbred

Ira Haas, Photo Researchers

Standardbred

erly Turk. In the late 1600's and early 1700's, European breeders crossed these stallions with their own horses to produce the first Thoroughbreds. Thoroughbreds are high-spirited, sensitive horses. They have powerful lungs and strong legs, which makes them especially well-suited for racing. Thoroughbreds are also used for jumping and hunting. In addition, many polo ponies are part Thoroughbred.

The Lipizzan horses, or Lipizzaners, come from horses imported into Austria from Spain and Italy during the middle 1500's. These beautiful show horses have strong bones, short legs, and thick, arched necks. They can make difficult jumps because of their powerful hindquarters. The best known Lipizzan horses are those trained at the Spanish Riding School of Vienna in Austria. These horses perform graceful jumping and dancing feats.

Light Harness Horses, sometimes called *Roadsters*, include the Morgan, the Hackney, and the Standardbred. The Standardbred, also called the American Trotting Horse, is considered the best horse for harness racing. Owners train Standardbred horses to race at either a trot or a pace. Breeders developed the Standardbred by crossing Thoroughbreds with Morgans and other breeds.

Color Types. Light horses are sometimes grouped according to color types instead of by breed. Such groups include Palominos and Albinos. Some people consider Appaloosas a color type, but these horses actually form a breed.

Palominos have a golden coat and a light blond or silvery mane and tail. Most of them have white only on the face and on the legs below the hocks and knees. Palominos belong to almost every breed except the Thoroughbred. A Palomino mare and stallion often produce a *foal* (baby horse) of another color. Breeders

Jerry Cooke, Photo Researchers

Lipizzaner

Robert Shiflet, Palomino Horse Breeders of America

Palomino

WORLD BOOK photo

Albino

Appaloosa Horse Club

Appaloosa

in the United States and Mexico developed the Palomino line.

Albinos. Some breeders use the word *albino* to describe any horse with a white or pale-colored coat. However, a true albino is an animal that, because of heredity, has no color in its eyes, hair, or skin. Its offspring also lack color.

All Albino horses have some color that their offspring can inherit. One kind of Albino has a pink skin, ivory coat, white mane, and blue eyes. Another kind has pink skin, a white coat, and brown eyes. Horses that are born black and turn white as they grow older are not usually called Albinos.

Appaloosas vary greatly in color. But the vast majority have a white area on the loin and hips with small, round or oval dark spots. Appaloosas are sometimes called *raindrop horses* because of their spots. They also have white-rimmed, humanlike eyes. Black and white stripes cover the hoofs of most Appaloosas. Spanish adventurers first brought Appaloosas to North America. The Nez Percé Indians of what are now Idaho and Washington bred these horses in the Palouse River region. The name *Appaloosa* comes from the word *Palouse.*

Heavy Horses

Draft Horses are the tallest, heaviest, and strongest group of horses. They are descended from the great war horses that heavily armored knights rode into battle. *Draft* (work) horses once supplied much of the power needed for jobs that heavy trucks and tractors do today. They pulled plows on farms and hauled freight wagons from town to town. Draft breeds include the Shire, Clydesdale, Belgian, Percheron, and Suffolk.

The Shire is the largest horse. This breed developed in England after King Henry VIII had all horses less than 5 feet (1.5 meters) high destroyed as useless.

The Clydesdale, one of the handsomest draft breeds, has long, flowing hair below the knee and the *hock* (joint on the hind legs). This hair, called "feathers," gives the animals a smart and unusual look. Clydesdales are popular horses for pulling wagons in parades.

The Belgian ranks among the gentlest and strongest

WORLD BOOK photo

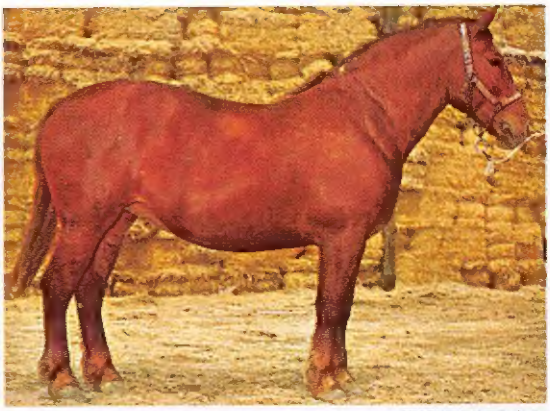
Shire

Anheuser-Busch, Inc.

Clydesdale

WORLD BOOK photo

Belgian



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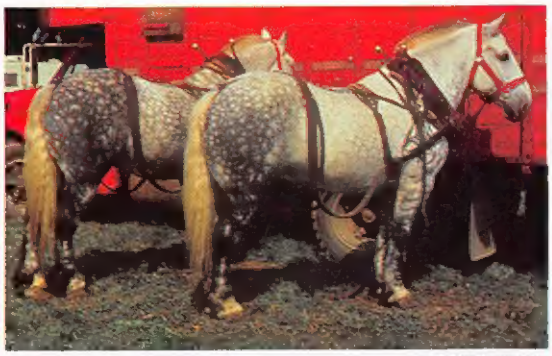
Suffolk



Walter Chandoha

Percherons

horses. Heavy muscles give the Belgian a stout appearance, and the head may seem too small for the huge body. Most Belgians have chestnut or bay-colored coats. Percherons look much like Belgians but have gray or black coats. These horses are lively for their size and may be used as a general-purpose horse. The Suffolk, a smaller, chestnut-colored horse, makes an ideal draft horse. It was a favorite for pulling milk wagons.

Heavy Harness Horses, also called *Coach Horses,* weigh less than draft horses and are not as strong. These horses can do light farm work and make good mounts for pleasure riding. European breeders developed heavy harness horses to pull coaches, wagons, and artillery. Breeds include the Cleveland Bay, French Coach (Normand), and German Coach (Oldenburger).

Cleveland Bays look like compact, rugged Thoroughbreds. They make excellent general-purpose horses for driving, riding, and hunting. The French Coach and German Coach breeds were popular in North America until the early 1900's but are seldom seen now.

Ponies

Well-trained ponies make good pets for children. Ponies learn quickly and are usually gentle. They are used for pleasure riding and can pull small carts. Most ponies live longer than other horses. They need only grass and hay as food. Breeds include the Shetland, Welsh, Hackney, Connemara, and Dartmoor.

A full-grown Shetland pony stands from 32 to 46 inches (81 to 117 centimeters) high. This favorite children's horse once pulled plows and wagons in its native Shetland Islands, north of Scotland. Miners in Wales developed the Welsh pony to work in the cramped

WORLD BOOK photo

Welsh Pony

WORLD BOOK photo

Shetland Pony

WORLD BOOK photo

Hackney Pony

Chicago Zoological Society

Przewalski's Horse

tunnels of coal mines. The Hackney is one of the largest pony breeds. The Irish Connemara ponies make good jumpers. Dartmoor ponies are strong and sure-footed.

Wild Horses

Two kinds of wild horses—*Przewalski's horse* and the *tarpan*—probably have the same ancestors that tame horses have. Some Przewalski's horses live in Mongolia, but most live in zoos. Tarpans, also called *forest horses*, once lived in parts of Europe, but they became extinct in the late 1800's. See PRZEWALSKI'S HORSE; TARPAN.

Horses that roam freely in parts of the western United States are often called "wild horses." But they are actually descendants of tame horses that were ridden by Spanish explorers, American Indians, and cowhands of the Old West. The horses escaped from their owners and eventually formed bands. In the early 1900's, more than 2,000,000 of these horses, also called *mustangs*, roamed the West. But people rounded up many of them to clear land for farms and ranches. Many mustangs were slaughtered and sold for use in pet food. Today, about 20,000 mustangs roam the West. Federal laws prohibit killing these horses, but some people hunt them illegally.

HORSE / *The Body of a Horse*

Size. Horse owners measure the height of a horse in *hands*, from the ground to the highest point of the *withers* (ridge between the shoulder bones). A hand equals 4 inches (10 centimeters), the average width of a man's hand. A horse that stands 14.2 hands (14 hands and 2 inches) is 58 inches (147 centimeters) high.

Coat and Skin. The horse's body is covered by a coat of hair. A healthy, glowing coat gives a horse a splendid appearance. A thick winter coat of hair grows every autumn and is shed every spring. Horses never shed the hair of the mane or the tail. If the mane and tail become too thick, the horse's owner may pull out some hair to make the horse look better. Pulling the hair does not hurt because the animal has no nerves at the roots of its hair. A horse uses its tail to help brush off annoying insects. A horse also has special muscles for twitching the skin to get rid of insects.

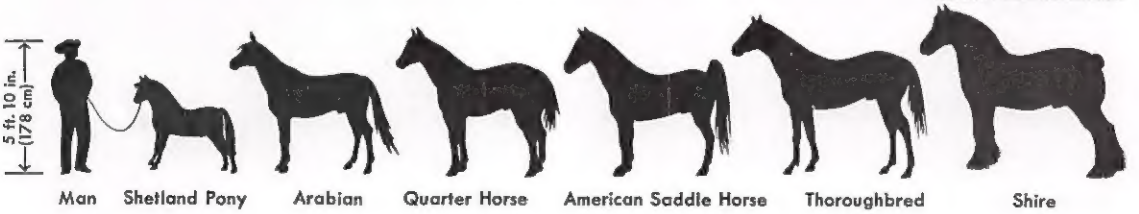
Sweat glands on the surface of the horse's body help

WORLD BOOK photo

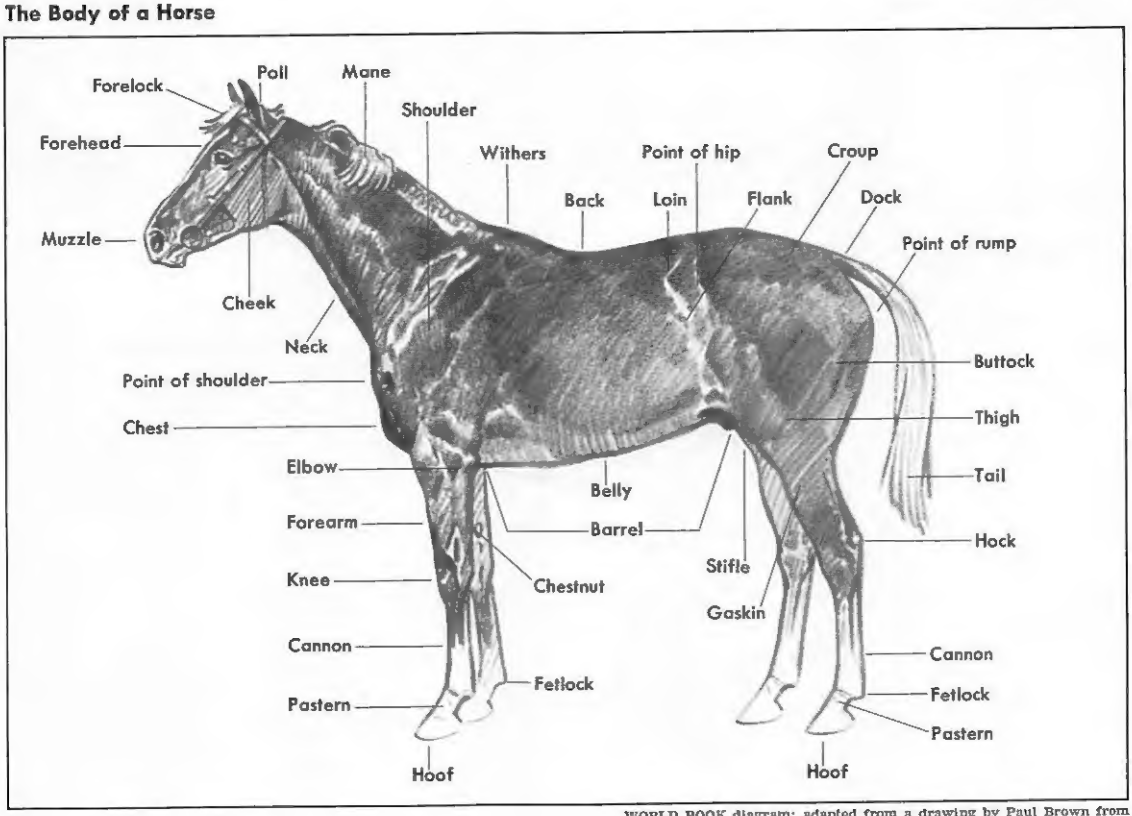
Pinto

The Sizes of Horses Horses range in height from less than 3 feet (0.9 meter) to more than 5 feet (1.5 meters) at the withers. These illustrations show how various breeds compare in height to an average-sized man.

WORLD BOOK illustration



The Body of a Horse



WORLD BOOK diagram; adapted from a drawing by Paul Brown from *The Horse*, © 1943, used with permission of Charles Scribner's Sons

the animal stay cool. The heavy coats of horses used for fast work, such as racing or polo, should be clipped in winter. The horses can then cool off more easily when they sweat. When the animals are resting, they should be covered with a blanket to keep them warm.

Horses have many colors, including various shades of black, brown, *chestnut* (reddish-brown), *dun* (yellowish-gray), gold, gray, *sorrel* (yellowish-brown), and white. *Bay* horses have a reddish-brown coat and black *points* (legs, mane, and tail). Many dark bays have brown hair on the back and reddish-brown hair on the flanks, underparts, and face. Chestnut horses may have *flaxen* (pale-yellow) or sorrel manes and tails, but not black points. Many gray horses are born a dark color and turn lighter as they grow older. Lipizzans and some other gray horses turn white by the time they are fully grown. *Roan* horses have a yellowish-brown or reddish-brown coat sprinkled with gray or white hairs. *Pintos*, also called *paints*, have a black or dark-colored coat with large white areas that vary in pattern.

Horse raisers often use special terms to describe the markings on a horse's face or legs. These terms include:

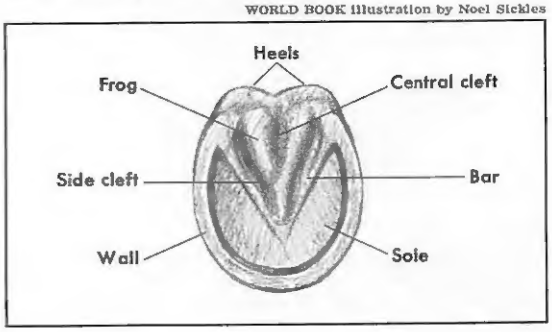
Baldface—a mostly white face.
Blaze—a large white patch on the face.
Race—a narrow strip down the center of the face.
Star—any small white patch on the forehead.
Snip—any small white patch near the muzzle.
Sock—a white patch above the foot.

Legs and Hoofs. A horse's legs are suited for fast running. Large muscles in the upper part of the legs provide great speed with a minimum of effort. The long, thin lower legs give the horse a long stride. The front legs carry most of the horse's weight. They absorb the jolts when the animal runs or jumps. The rear legs provide power for running or jumping.

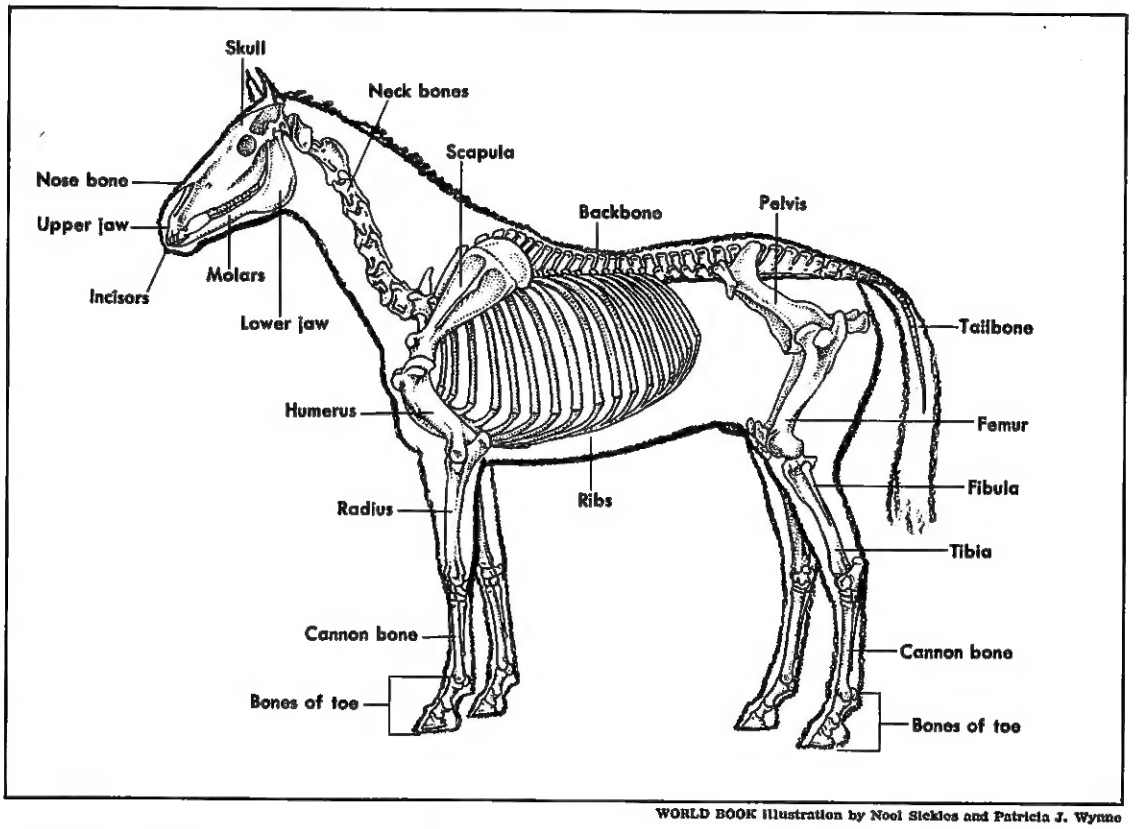
Thousands of years of evolution have given the horse feet ideally suited for running. Each foot is really a strong toe. Only the tip of the toe, protected by the strong, curved hoof, touches the ground. The remains of what were once two other toes grow as bony strips on the *cannon* bone of the horse's legs. The *frog* (an elastic

The Bottom of a Horse's Hoof

WORLD BOOK illustration by Noel Sickles

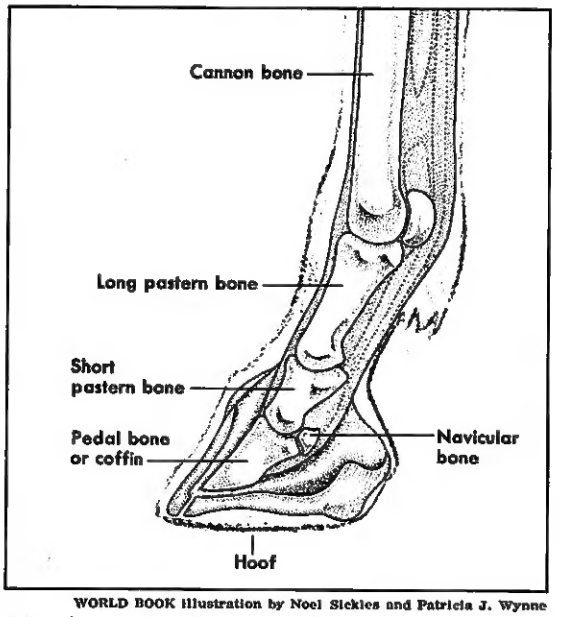


The Skeleton of a Horse



WORLD BOOK illustration by Noel Sickles and Patricia J. Wynne

The Foot of a Horse



WORLD BOOK illustration by Noel Sickles and Patricia J. Wynne

A horse's foot has a single toe, which is formed by the pastern bones and the pedal bone. A horse walks on the tips of its toes, each of which is covered by a strong, hard hoof.

mass on the sole of the foot) acts like a rubber heel. It helps absorb the jolt when the hoof strikes the ground. The horse's real heel bone is the *hock*, located about halfway up the leg. The hock never touches the ground.

A horse with a bad fracture is usually killed because the break causes shock and extreme pain. However, certain kinds of broken bones do not cause much pain and may heal. Veterinarians treat such breaks with slings and casts.

Teeth. Most male horses have 40 teeth, and most females have 36. The *molars* (back teeth) grind food as the horse chews. These teeth have no nerves, and they never stop growing. Sometimes the molars grow unevenly and must be filed down so the horse can chew properly.

An expert on horses can tell a horse's age by counting the number of teeth and checking their condition. Most foals are born toothless but soon get two upper and two lower front teeth. When 4 months old, the horse has four upper and four lower teeth. At the age of 1 year, it has six pairs of upper and lower *incisors* (cutting teeth). At 5 years, a horse has 12 pairs of incisors and is said to have a full mouth. Adult horses have six pairs of molars. Males grow four extra teeth at the age of 5. By the time a horse is 8 years old, the rough grinding surfaces of the bottom incisors have been worn down. The horse has a smooth mouth and is said to be *aged*. Sometimes tiny wolf teeth grow in

front of the molars. These teeth interfere with the *bit*, the part of a bridle that goes into the horse's mouth. Wolf teeth are usually removed. The bit rests in spaces between the horse's incisors and molars.

Senses. Horses have larger eyes than any other land animals except ostriches. A horse's eyes are oval, and they are set on the sides of the head. The two eyes can be moved independently, each in a half circle. Thus, a horse can look forward with one eye and backward with the other. Because of the position of its eyes, a horse has a blind spot a short distance in front of it. A horse must turn its head to see a nearby object that lies directly ahead. The shape of a horse's eyes makes objects far to the side or back appear to move faster than they actually do. For this reason, a horse may *shy* (move suddenly) at the slightest movement of an object to the side or back. Horses' eyes require a fairly long time to adjust to changes of light. When a horse is moved from a dark stall into bright sunlight, it may appear nervous until its eyes adjust.

Horses have keen hearing. They have short, pointed ears that they can move around to pick up sounds from almost any direction. Certain positions of the ears may indicate a horse's attitude. For example, when a horse points its ears forward, it is curious about an object in front of it. When a horse twitches its ears or lays them back against the head, it is angry and may kick.

Horses have a well-developed sense of smell. Their nostrils are very large and can pick up scents from long distances. A strong wind and heavy rain interfere with the sense of smell and cause horses to become nervous.

The sense of touch varies among different breeds of horses. The thin skin of most breeds of light horses is sensitive to insects and rough objects. Most breeds of heavy horses are less sensitive to such irritations.

Intelligence. Horses can learn to follow signals, but they must be taught through constant repetition. They also must be encouraged to overcome their fear of unfamiliar objects and situations. Horses have excellent memories and can recall pleasant or unpleasant experiences many years after they occur. See ANIMAL (Intelligence of Animals).

Life History. A mare carries her foal for about 11 months before giving birth. This period may vary from 10 to 14 months. Foals can stand shortly after birth, and within a few hours they are able to run about. The legs of newborn horses seem much too long for their bodies. As the horse matures, the legs grow more slowly than the rest of the body.

A year-old colt is about half grown. Most horses reach full height and weight by the age of 5. Most horse raisers breed mares at the age of 3 or 4, and stallions at the age of 2. Most mares have five or six foals during their life, but some have as many as 19.

All race horses have their official birthday on January 1, except in the Southern Hemisphere, where it is on August 1. Regardless of their actual birth date, race horses become a year older on their official birthday. This system is used to qualify horses for races limited to certain age groups. For example, only 3-year-olds race in the Kentucky Derby. Most horses live from 20 to 30 years.

Equipment for horseback riding includes the rider's clothing, spurs, and whip. It also includes *tack* (gear) for the horse, such as the saddle and bridle.

Clothes for Riding. Riders wear comfortable clothing suitable for their type of riding. Their clothes also must protect their legs from irritation while rubbing against the saddle. Blue jeans and a comfortable shirt are probably best for open-country riding. Cowhands often wear *chaps* (seatless leather trousers) that fit over their regular trousers. Chaps protect the legs from being scratched by brush.

For English riding, *jodhpurs* (long, tight-fitting breeches) or regular riding breeches are usually worn. They provide both comfort and protection. Boots, or any shoes with heels, keep the feet from slipping out of the stirrups. Some riders wear hard caps to protect their head in case of a fall.

Spurs. Skilled riders use spurs to signal the horse without moving their legs or heels vigorously. Some riders in horse shows use spurs to give commands or to urge their mounts to run faster. Spurs should be worn only by expert riders.

Spurs called *dummy spurs* have either blunt *rowels* (little wheels) or no rowels. Some spurs have sharp points instead of rowels. *Racing spurs* have rowels on the inside to make it easy to touch the horse. Rowels on racing spurs and dummy spurs point downward. Most *dressage spurs* have sharp rowels. They curve upward so that riders need not shift their feet to touch the horse.

The Whip. An expert rider uses a whip to give the horse special signals or to train the animal. Horse whips are lightweight and flexible and cause no pain if properly used. Horses learn to respond to signals from a trainer's whip when performing different steps and difficult movements in horse shows. Race horses increase their speed at a touch of the jockey's whip. A *riding crop* may be used like a whip. Crops have stiff handles. The tip is a large loop of rawhide. In fox hunting, riders use a *hunting whip*, which has a curved, wooden or bone handle at one end and a long leather lash at the other end. The lash is used to control the hounds.

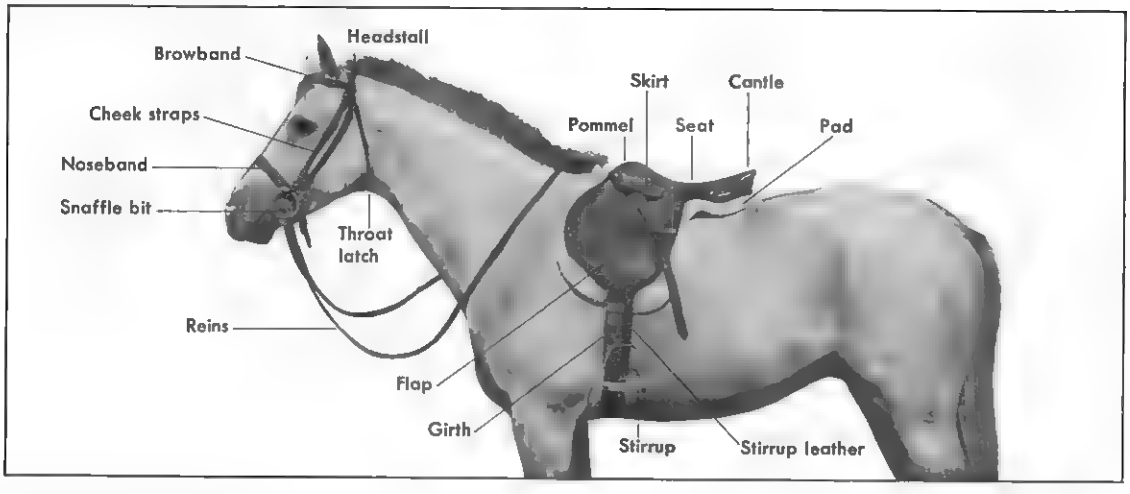
Experienced riders apply whips as punishment only if the horse kicks or bites at another horse or stubbornly disobeys a command. The rider immediately strikes the horse sharply on the flanks.

The Saddle. Riders in the United States generally use an *English saddle* or a *Western saddle*. A person should use the kind of saddle that feels most comfortable or that suits a particular type of riding.

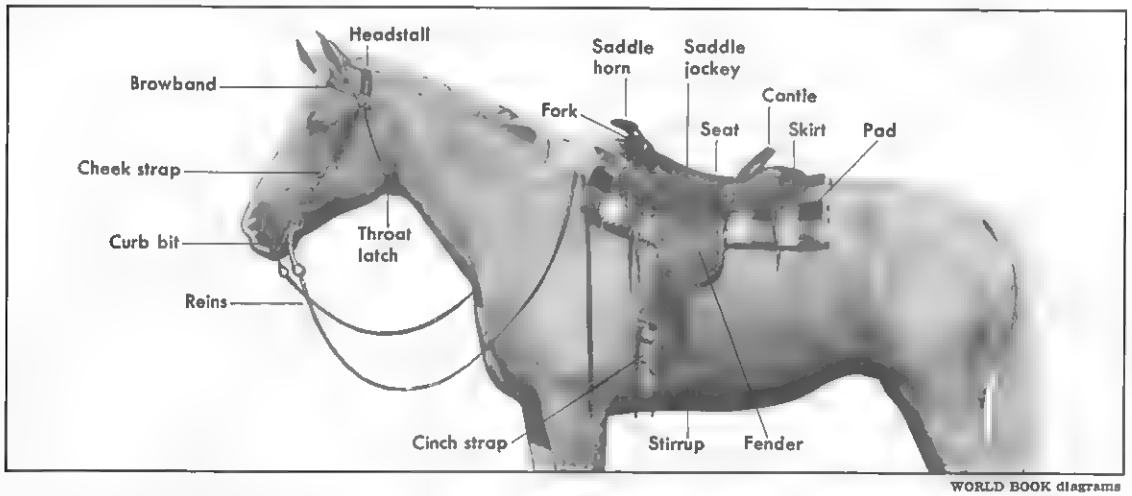
Riding Equipment

Bit is the metal part of the bridle that fits in a horse's mouth.
Bridle is the headgear used to control a horse. It includes the bit.
Girth is a leather or canvas strap that fits under the horse's belly and holds a saddle in place.
Hackamore is a bitless bridle that controls the horse by pressure on its nose and jaw.
Reins are long, narrow leather strips attached at one end to the bit. The rider holds the other end.
Tack is riding equipment, such as the bridle and saddle.

English Riding Equipment



Western Riding Equipment



WORLD BOOK diagrams

Riders who prefer the English saddle like it because it is padded and more comfortable. It is also flatter and weighs less than the Western saddle. Jockeys, jumpers, exhibition riders, and others who need extra speed from their horses use the English saddle because it interferes with the horse's movements less than a Western saddle does.

The Western saddle has wide stirrups and a *horn*, to which a rope may be fastened. Cowhands and rodeo riders use Western saddles. Cowhands may tie their ropes to the horn when roping cattle. They usually use a *double girth* (two saddle straps) on the Western saddle to hold it securely against the pull of roped cattle. A blanket under the saddle keeps the horse's back and sides from becoming sore. Most Western saddles have fleece padding that helps protect the horse's back.

The Bridle is used to control the horse. It consists of straps and metal pieces that fit on the horse's head and in its mouth.

The simplest bridle is the *snaffle bridle*. This bridle has a jointed bit that is gentle on the horse. The bit of the snaffle bridle pulls on the corners of the horse's lips. The bridle's single set of reins can be handled easily by the rider.

The *double*, or *full*, *bridle* is used by advanced riders. It has a double set of reins, a snaffle bit, and a *curb bit*. The curb bit fits between the horse's teeth on sensitive spaces called *bars*. This bit puts pressure on the horse's lower jaw. A separate set of reins controls each of the bits. The upper reins move the snaffle bit, and the lower reins operate the curb bit. Pressure on the snaffle bit causes the horse to raise its head. Pressure on the curb bit pulls the horse's head down and brings the animal to an abrupt halt. Cowhands and polo players use the curb bit to stop their horses quickly. Another kind of bridle, the *Pelham bridle*, combines the snaffle and curb bits into one bit with double reins.

The art of riding and managing horses is called *horsemanship*. Many persons enjoy riding horseback for fun and sport. The basic techniques of English and Western riding are similar.

Selecting a Horse. The selection of a horse depends partly on the skill of the rider. Experienced riders may prefer responsive, high-spirited horses. But most beginners feel at ease on a gentle, reliable horse. Youngsters may be more comfortable on a pony than on a large horse. *Geldings*, which are male horses that have had their sex organs removed, are easier to control than stallions or mares. In choosing a horse to buy, a person should also consider such factors as the animal's age, training, and physical condition. A well-trained horse over 10 years old is best for a beginning rider. An expert should ride the horse to determine how trained it is. In addition, a veterinarian should examine the animal and check for possible health problems.

Mounting a Horse. The first things a rider learns are how to *mount* (get on) a horse and sit in the saddle.

The rider mounts on the horse's left side. Most horses become used to being mounted from the left side during training. Someone mounting from the right side might startle or confuse them. The custom of mounting from the left probably started when men wore long swords that hung down along the left leg. It was easier to throw the right leg across the horse's back than to throw the left leg and the heavy sword. Many horses trained to travel on mountain trails can be mounted from either side. Riders mount from the side that is least likely to cause the horse to lose its balance.

After mounting, the rider sits in a relaxed position. The rider's weight should be settled firmly in the *dip* (middle of the saddle). The back is held erect but not stiff.

To Start a Horse, the rider squeezes both legs against its sides. As the horse moves forward, the rider lets the reins follow the movement of the horse's head. Riders should look where they are going, not at the horse.

To Control a Horse, riders use their hands, legs, and body weight. English riders call these skills the *aids*. Western riders refer to them as *cues*. Skilled riders can put their mounts through difficult performances and tricks with only slight movements of their hands or legs. Riders in horse shows change gaits time after time with no apparent signals. Cowhand horses and polo ponies respond quickly to signs. They start, stop, or turn at a touch of the rider's hand or leg, or at the shifting of weight.

Trainers teach horses to move *away from the leg*. The horse moves to the right when the rider's left leg presses against its side, and to the left when it feels the rider's right leg.

In English riding, horses are taught to move *toward the hand*. The reins in the rider's hands lead to the bit in the horse's mouth. When the rider pulls the right rein, the bit pulls on the right side of the horse's mouth. The horse then turns in that direction. Horses trained for Western riding learn to respond to the touch of the reins against the neck. The horse turns away from this signal. At a touch of the rein on the right side of the neck, the horse turns left.

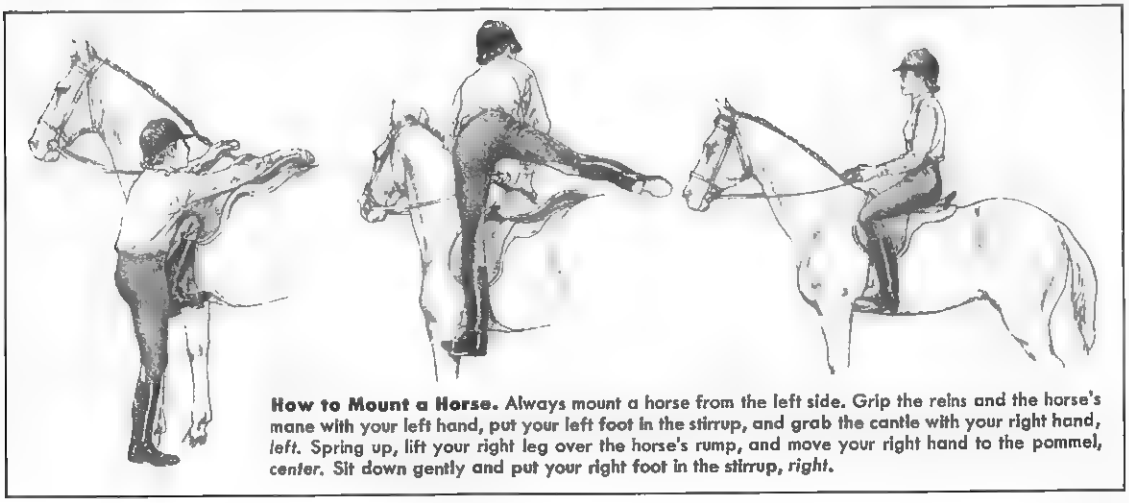
Skilled riders shift their weight in the direction of the horse's movement. They move forward when the horse goes forward, and to the right or left when turning. They also shift their body back a little in the saddle when slowing up or stopping. A good rider does all these things so smoothly that only the horse knows that the rider has changed balance.

To Stop a Horse, riders shift their balance back a little in the saddle. Then they squeeze their fingers to increase the pressure on the reins slightly without tugging on them. When the horse stops, the rider eases the pressure on the reins.

To Move a Horse Backwards, the rider squeezes both reins equally, preventing the horse from moving forward, and presses both legs against the girth of the saddle. A well-trained horse will then step backwards.

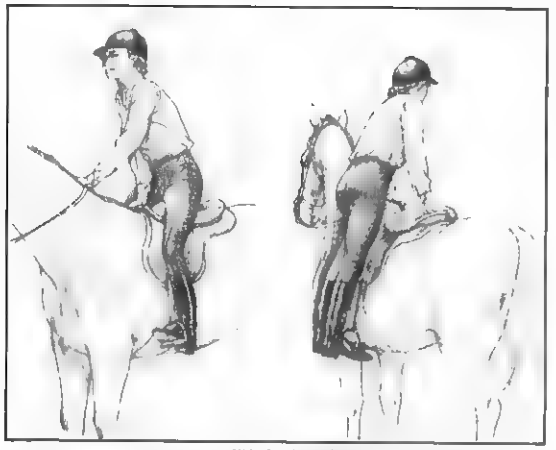
Gaits are the ways a horse moves. Horses have three natural gaits: (1) walk, (2) trot, and (3) canter. A fast canter is often called a gallop. Many horses are trained for three speeds at each of the three natural gaits. Train-

WORLD BOOK illustrations by Robert Keys



How to Mount a Horse. Always mount a horse from the left side. Grip the reins and the horse's mane with your left hand, put your left foot in the stirrup, and grab the cantle with your right hand, *left*. Spring up, lift your right leg over the horse's rump, and move your right hand to the pommel, *center*. Sit down gently and put your right foot in the stirrup, *right*.

Holding the Reins. The illustration at the left shows how to hold the reins. Keep your hands about 2 inches (5 centimeters) apart and slightly above the horse's withers.



WORLD BOOK illustrations by Robert Keys

How to Dismount from a Horse. Grip the reins and the horse's mane with your left hand and put your right hand on the pommel, *left*. Swing your right leg over the horse's rump and bring it next to your left leg, moving your right hand to the cantle, *right*. Balancing your body with your hands, remove your left foot from the stirrup and drop down.

ers also develop artificial gaits in some horses. Horses so trained compete in horse shows and perform in circuses, fairs, and rodeos. Artificial gaits include the pace, slow gait, and rack.

Walk is the slowest gait. The horse moves at a speed of about 4 miles (6 kilometers) an hour. It raises one foot after another and puts them down in the same order. The horse keeps its balance by alternating its front and back feet, and its right and left feet. For example, the order may be (1) right forefoot, (2) left hind foot, (3) left forefoot, and (4) right hind foot.

Trot is a two-beat gait at a speed of about 9 miles (14 kilometers) an hour. The front leg on one side of the body and the hind leg on the other side hit the ground together. The horse bends its legs more when trotting than when walking. Harness-race horses trot around the track while pulling a driver in a *sulky* (two-wheeled cart).

When beginners first ride at a trot, they should hold onto the horse's mane or the saddle until they get used to the motion. On the first beat of a trot, riders raise their body slightly by pushing their feet down on the stirrups. They come down in the saddle on the second beat and then go right up again. This method of riding is called *posting*. A beginner should practice the movements of posting while the horse is walking.

Canter is a comfortable, three-beat rhythmic riding gait. A horse canters at a speed of 10 to 12 miles (16 to 19 kilometers) an hour. On the first beat, one forefoot strikes the ground. Then the other forefoot and opposite hind leg hit the ground together. On the third beat, the other hind foot strikes the ground.

Gallop is a horse's fastest natural gait. Horses gallop in a leaping and bounding motion. On the first beat, a hind foot strikes the ground. The other hind foot and opposite forefoot hit the ground together. On the third beat, the other forefoot strikes the ground. Then the horse leaps forward, and all its feet leave the ground. A racing horse runs at an extended gallop.

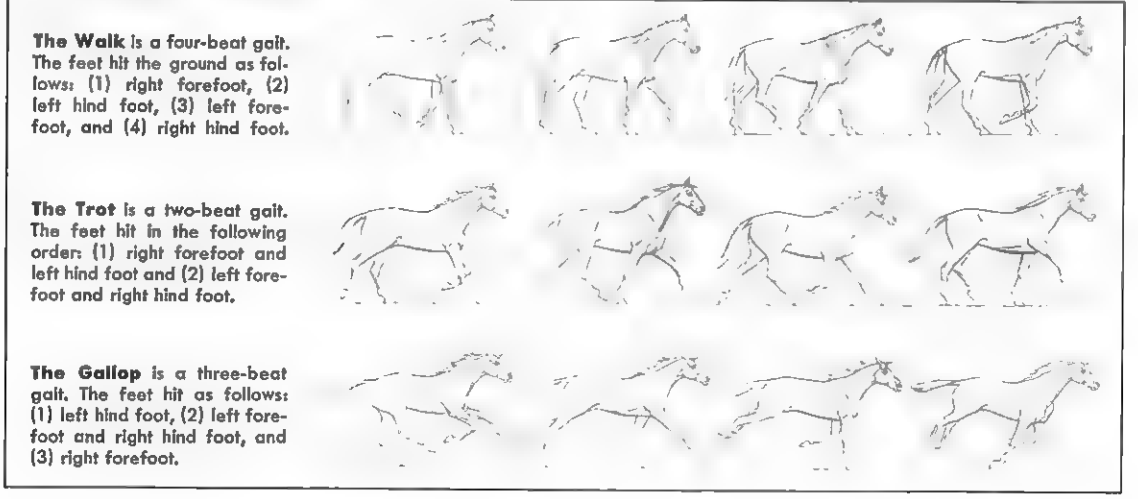
Pace, like the trot, is a gait used in harness racing. When a horse paces, it moves the legs on the same side of the body at the same time. The pace is an uncomfortable riding gait.

Slow Gait is a slow, four-beat gait. Four beats of the hoofs can be heard as the horse moves forward.

Rack is a fast, smooth, four-beat gait. It resembles the slow gait but is faster. Five-gaited saddle horses are trained to slow gait and rack.

The Three Natural Gaits of a Horse

WORLD BOOK illustrations by H. Charles McBarron



The Walk is a four-beat gait. The feet hit the ground as follows: (1) right forefoot, (2) left hind foot, (3) left forefoot, and (4) right hind foot.

The Trot is a two-beat gait. The feet hit in the following order: (1) right forefoot and left hind foot and (2) left forefoot and right hind foot.

The Gallop is a three-beat gait. The feet hit as follows: (1) left hind foot, (2) left forefoot and right hind foot, and (3) right forefoot.

The Stall. A horse should live in a clean, comfortable stall that measures at least 10 feet by 10 feet (3 meters by 3 meters). The stable should be light, dry, and well ventilated. Clay or finely ground cinders make the best floor, but cement or wooden floors can be used. Bedding spread at least 1 foot (30 centimeters) thick over the floor gives the horse a comfortable resting place. Wood shavings, sawdust, straw, or peat moss make good bedding materials. Horses can sleep standing up and often doze while standing with their eyes wide open.

Food. A horse needs food at least three times a day. The horse's stomach is small for the size of its body and holds about 18 quarts (17 liters) of food. In comparison, a man's stomach holds little more than 1 quart (0.95 liter) of food.

Horses eat grass, grain, and hay. When a horse eats grain or hay, it gathers the food with its lips. When a horse eats grass, it bites off the blades close to the ground. Horses chew their food slowly and thoroughly. They do not chew a cud as do cows and deer.

Hay for horses should be placed in a net or on a *rack* (wooden frame). A *manger* (open box) holds the grain. A 1,000-pound (450-kilogram) horse that works three or four hours a day needs about 14 pounds (6.4 kilograms) of hay—5 pounds (2.3 kilograms) in the morning and the rest at night. A horse should never eat moldy or dusty hay or hay that contains coarse sticks, thorns, or rubbish. Timothy, or timothy mixed with clover or alfalfa, makes the best hay.

Horses like oats more than any other grain or hay. But they will eat oats too quickly unless they have some hay first. Working horses eat from 4 to 12 quarts (3.8 to 11.4 liters) of oats, or a mixture of oats and bran, every day. The exact amount depends on the animal's size, condition, and the amount of exercise it gets. A third of the feed should be given in the morning, a third at noon, and the rest at night.

Most horses require from 10 to 12 gallons (38 to 45 liters) of fresh, clean water daily. A horse should not be permitted to drink large amounts of water when the animal is hot or before it begins hard exercise.

Horses need salt for good health because their bodies lose salt when they sweat. A horse eats about 2 ounces (57 grams) of salt daily. A box of salt or a solid salt block in the stable and in the pasture provides this important part of the diet.

Grooming helps keep a horse healthy and improves its appearance. Horses kept in a stable should be groomed daily with a rubber currycomb, body brush, hoof pick, and mane and tail comb. Long, sweeping brush strokes in the direction of the growth of the hair help give the coat a healthy glow. Brushing removes dirt and dandruff. Areas touched by the saddle and girth, and the regions behind the heels and in the hock depressions, need special brushing. A thorough wiping with a soft cloth should follow the brushing. The hoof pick removes dirt and stones and other objects from the feet.

Daily Grooming of a Horse's Coat and Mane helps maintain the animal's health and improves its appearance. The coat should be brushed thoroughly and then wiped with a soft cloth, *above*. The mane should be combed to untangle the hairs, *right*.

Cleaning a Horse's Hoofs is part of the daily care that the animal should receive. A hoof pick should be used to remove dirt and stones and other objects from the hoofs, *above*.

WORLD BOOK photos

John Messineo, Tom Stack & Assoc.

Medical Care of a Horse includes periodic examinations by a veterinarian. As part of an examination, the doctor checks the condition of the animal's teeth and mouth, above.

Shoes protect the feet of horses that run or work on roads and other hard surfaces such as race tracks. Light shoes, weighing about 8 ounces (230 grams) and having only a few nails, make the best shoes for most horses. Some riding horses wear shoes weighted in the toes to help them raise their feet high. Race horses wear light shoes that may wear out after a few races. Shoes for wear in winter or for high mountain trails have cleats that help keep the horse from slipping on ice or snow.

Medical Care. Horses should be examined by a veterinarian at least once or twice a year. They should be vaccinated against tetanus, influenza, and other diseases. When necessary, they should receive medicine to expel worms. Sometimes, a horse's teeth must be *floated* (filed down to remove sharp edges).

Horse owners can prevent many medical problems by feeding and bedding the animals properly, keeping them and their living quarters clean, and exercising the horses daily. Owners should watch for any changes in the condition or behavior of their horses and call a veterinarian if a horse appears ill. Signs of illness include loss of appetite, lack of vigor, mucous or bloody discharges from the eyes or nose, swellings or sores on the body, and hot legs or feet. A fast or slow breathing rate or pulse rate may also be a sign of illness. Normally, a resting horse breathes from 8 to 16 times per minute and has a pulse rate of from 30 to 40 beats per minute.

A horse's legs and feet easily become diseased if not cared for properly. Some common diseases of the legs and feet include *thrush*, *navicular*, and *laminitis*. Thrush is an infection of the frog. It can be prevented by providing clean, dry bedding for a horse. To treat thrush, veterinarians apply medication to the affected frog. Navicular is a disease of the foot bone that causes a horse's legs to become stiff and sore. It is treated with corrective shoeing and drugs. Laminitis, also called *founder*, is an inflammation of the foot. Its symptoms include lameness, hot feet, and increased pulse rate. Laminitis is treated by applying medication and soaking the foot in warm water.

Horse shows and sports involving horses include a variety of events that test the speed, strength, and other abilities of the animals. Success in these events also depends on the skill of the riders or drivers. Horse shows and sports have increased greatly in popularity during the 1900's. They are enjoyed by millions of people throughout the world and include local, national, and international competitions.

The Olympic Games have three kinds of *equestrian* (horseback riding) sports: (1) jumping, (2) dressage, and (3) eventing. The International Equestrian Federation regulates the Olympic equestrian events. It also regulates the world championships in *driving*, an event for harness horses and drivers. More than 60 nations belong to the federation.

This section describes horse shows, jumping, dressage, and eventing. WORLD BOOK has separate articles on the sports of fox hunting, harness racing, horse racing, polo, rodeo, and steeplechasing.

Horse Shows have three main types of competitions: (1) performance, (2) breeding, and (3) *equitation* (horsemanship). In performance competition, the horses and riders demonstrate various skills. For example, a show may include jumping, five-gaited riding, or driving events. In breeding competition, all the horses in the event must be of the same breed. They are displayed without saddles. The judges rank the horses on *conformation* (physical qualities) and decide which ones best represent the breed. In equitation competition, the contestants ride their horses around a ring. They are judged on their riding style and control of the horse.

Some horse shows are restricted to only one breed of horses. Others include events for many breeds. Shows may be held indoors or outdoors and may last from a few hours to a week or more.

Robert Frerck

A Jumping Course consists of different types of obstacles that the contestants must clear. The course shown above includes such standard obstacles as a stone wall and parallel bars.

Karl Leck

A Well-Performed Jump requires harmony between the rider and horse. For example, the rider must adapt to the horse's movements and, as shown above, lean forward as the animal jumps.

Many organizations sponsor horse shows in the United States. The American Horse Shows Association (AHSA) approves about 1,600 shows a year, including the trials for the United States Equestrian Team. The U.S. Equestrian Team represents the United States in the Olympic Games and other international competitions. The most important horse shows in the United States include the National Horse Show in New York City; the American Royal Horse Show in Kansas City, Kans.; and the Grand National Horse Show in San Francisco, Calif.

Jumping. In jumping competitions, the contestants ride across a specially designed course that has obstacles for the horses to leap over. The course may include high jumps, wide jumps, and two or more jumps set close together. The courses vary in difficulty, depending on the level of the competition. The contestants receive *faults* (penalties) for falls, knocking down part of an obstacle, *refusals*, and other errors. A refusal occurs when the horse will not jump over an obstacle. After three refusals, the horse and rider are eliminated from the competition. The contestant with the fewest faults wins the event. In some jumping events, the contestants are timed. In case of a tie for first place, the contestant who completes the course in the shortest time wins.

The main kinds of jumping competitions include (1) Nations' Cup, (2) puissance, and (3) Grand Prix. In Nations' Cups, teams from different countries compete. In most cases, each team consists of four riders and their horses. The three best scores of each team are added to determine the winning team. Puissance events consist mainly of high jumps. The contestants who complete the course without any faults or with equal faults participate in a jump-off. In the jump-off, the number of obstacles is reduced, but the remaining obstacles are raised or widened. The contestants may have several jump-offs, until all except the winner fail to clear the obstacles. Grand Prix competitions are part of the Olympic Games. All contestants complete the course once, and then the top two or more riders participate in a jump-off. In case of a tie for first, the contestant who completes the course in the shortest time wins.

Dressage. In dressage competitions, the riders guide their horses through a series of movements at the walk, trot, and canter, using mainly leg and seat signals. The horse's movements should be smooth, precise, and graceful, and the rider's signals should not be visible to the spectators.

Special dressage movements include the *passage*, *piaffer*, and *pirouette*. A passage is a rhythmic, elevated trot in which the horse slowly moves forward. A piaffer resembles a trot, but it is performed without any forward, backward, or sideward movement. A pirouette is a circle that the horse makes by pivoting its forelegs and one hind leg around the other hind leg.

Alix Coleman

The Cross-Country Event is the most strenuous part of a type of equestrian competition called *eventing*. The contestants must ride over rough terrain, crossing streams and other obstacles, *left*.

Alix Coleman

Dressage Competition consists of a series of smooth, graceful movements performed by the horse in response to signals by the rider. These signals should not be seen by the spectators.

In dressage competitions, the series of movements must be performed in a specific order. In most cases, the contestants are judged by two or more officials who sit in various places around the ring. Each judge gives a contestant points for the performance of each movement and penalties for errors. The scores of all the judges are added, and the contestant with the most points wins.

Dressage techniques were originated by military officers who rode horseback. They had to use their hands to hold weapons, and so they gave signals to their horses with their legs and by shifting their body weight.

Eventing is often called the *Three-Day Event* because most major competitions take place during a three-day period. The contestants first compete in a dressage event. They then participate in a cross-country event. They ride over a course that may be more than 10 miles (16 kilometers) long and includes rough terrain and such obstacles as brush hedges, rail fences, and streams. The contestants receive penalties for falls, refusals, and failure to complete the course in the allotted time. Lastly, a stadium jumping competition is held. The results from the events of the three days are added, and the contestant with the fewest penalties wins.

Eventing is probably the most challenging equestrian event. It tests the endurance, obedience, jumping ability, and other qualities of the horse and the skill and daring of the rider. The cross-country event is extremely strenuous.

Raising horses for racing, driving, and other sports involves careful breeding and training. It is an important industry in the United States. California, Kentucky, Texas, Virginia, and many other states have large breeding farms that raise horses.

Breeding Horses. On breeding farms, stallions and mares are carefully selected for mating on the basis of their ancestry and physical qualities. Breeders of race horses also consider the racing records of the animals. An owner of a champion racing stallion may earn millions of dollars in *stud fees* by using the horse for breeding purposes. A stud fee is a sum of money paid to a stallion's owner for the use of the stallion to sire a foal. Breeding horses is not an exact science, and breeders can never be completely certain of producing a colt or filly of champion quality.

Most breeders mate their mares to a stallion in spring. The mares give birth about springtime the following year. People who raise race horses want their foals to be born as soon as possible after January 1 because the foals will be considered yearlings the following January. A foal that is born early in the year has more time to grow and develop before it races as a 2-year-old.

A foal stays with its mother for the first six months after birth. The owner then *weans* (separates) the foal from its mother and puts it out to pasture with other foals.

People who raise purebred horses enter their foals in the *registry* of the association for the particular breed. A registry is an official record that lists a horse's sire and dam and other information. Horses that appear

Leading Horse-Raising Countries

Horses in each country in 1976

Brazil	9,600,000
United States	9,449,000
China	7,000,000
Russia	6,400,000
Mexico	5,818,000
Argentina	3,500,000
Mongolia	2,255,000
Poland	2,151,000
Ethiopia	1,510,000
Colombia	1,500,000

Source: FAO.

William Strode, Woodfin Camp, Inc.

A Newborn Foal is cared for by its mother. The mare nurses the foal for the first six months after birth. The owner then weans the foal by separating it from the mother and putting it out to pasture with other foals.

in a breed registry are called *registered horses*. In the United States, there are about 70 breed associations that keep registries. The two largest ones are the Jockey Club, which registers Thoroughbreds, and the American Quarter Horse Association. Many other countries also have breed associations and registries. Nations that are well known for breeding horses include Argentina, Canada, France, Great Britain, and New Zealand.

Training Horses requires great skill and patience. Expert trainers handle horses gently but firmly and teach them slowly. Soon after birth, a foal learns to accept handling by human beings. Some trainers begin to accustom a foal to a halter almost immediately. Others do not halter-break foals until they are several months old. After a horse is 1 year old, the trainer gradually accustoms it to having a saddle on its back. Then the horse is mounted and ridden a few steps. Most horses that are trained slowly and patiently do not buck when they are mounted for the first time. A harness horse is also trained in gradual steps. It is first taught to respond to signals from long reins, which are held by a person who walks behind the animal. Later, the horse learns to pull a light buggy or carriage.

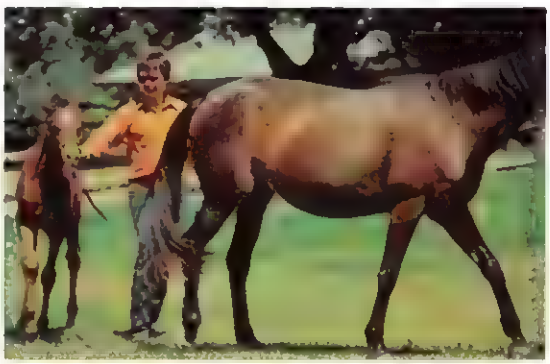
After a horse has learned to follow the signals of a rider or driver, it is trained for a certain sport. For example, Thoroughbred race horses learn to run when a starting gate swings open. Harness racing horses learn to trot or pace behind a moving starting gate that is attached to a car.

Leading Horse-Raising States

Estimated number of horses in the state in 1976

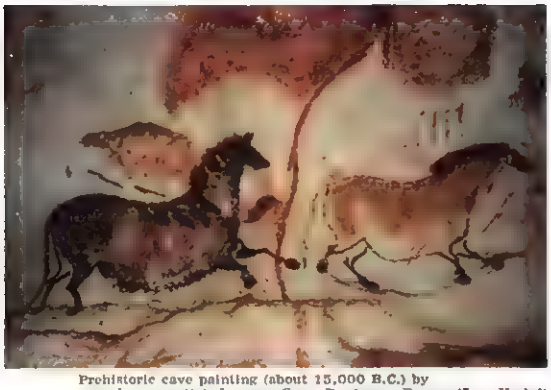
California	832,000
Texas	816,000
Illinois	305,000
Oklahoma	285,000
New York	280,000
Montana	279,000
Ohio	232,000
Missouri	223,000
Tennessee	222,000
Michigan	214,000
Kentucky	205,000

Source: American Horse Council, Inc.



WORLD BOOK photo

Training a Colt to Lead. A colt learns to *lead*—that is, to follow a person who guides it with a strap—by being led around a ring behind its mother. The colt follows naturally.



Prehistoric cave painting (about 15,000 B.C.) by an unknown artist; Lascaux Cave, Dordogne, France (Jean Vertut)

Prehistoric Paintings of Horses have been found in many caves in Europe. The painting shown above, from the Lascaux Cave in southwestern France, is about 17,000 years old.

Origins of the Horse. Scientists believe that the earliest ancestor of the horse was a small animal about 10 to 20 inches (25 to 51 centimeters) high. They call this animal *Eohippus* (dawn horse) or *Hyracotherium*. It lived about 55 million years ago in what is now North America and Europe.

These prehistoric horses had arched backs and snout-like noses. They looked more like racing dogs, such as greyhounds or whippets, than like the straight-backed, long-faced modern horse. They had four toes on their front feet and three toes on their hind feet. Each toe ended in a separate small hoof. Large, tough pads similar to those on a dog's foot kept the toes off the ground. These pads bore the animal's weight.

The next important ancestor of the modern horse was *Mesohippus* (middle horse). It lived about 35 million years ago. Mesohippus averaged about 20 inches (51 centimeters) in height and had long, slender legs. Each foot had three toes, of which the middle toe was longest. About 30 million years ago, Mesohippus gave way to a new horselike creature, *Miohippus*. This animal stood from 24 to 28 inches (61 to 71 centimeters) tall, and its middle toe was longer and stronger than that of its ancestors.

Horselike animals continued to develop, and *Merychippus* (ruminant or cud-chewing horse) appeared about 26 million years ago. It grew about 40 inches (100 centimeters) high. Like Miohippus, it had three toes on each foot. The side toes were almost useless, but the center toe grew long and strong. It ended in a large, curved hoof and bore all the animal's weight.

By about 1 million years ago, horses probably looked somewhat like modern horses. They grew larger than their ancestors. The side toes on their feet became short bones along the legs, leaving the strong center toe with its hoof to support the animals. The teeth also changed, becoming better fitted for eating grass. Scientists group these horses, along with the modern domestic horse, under the name *Equus*.

No one knows where horses originated. Fossils show that during the Ice Age horses lived on every continent except Australia. Great herds wandered throughout North and South America. Then, for some unknown reason, they disappeared from the Western Hemisphere.

People Tame the Horse. Primitive people hunted horses and ate their meat. No one knows who first tamed horses and trained them for riding. Scientific discoveries at the ancient city of Susa in southwestern Asia show that people rode horseback more than 5,000 years ago.

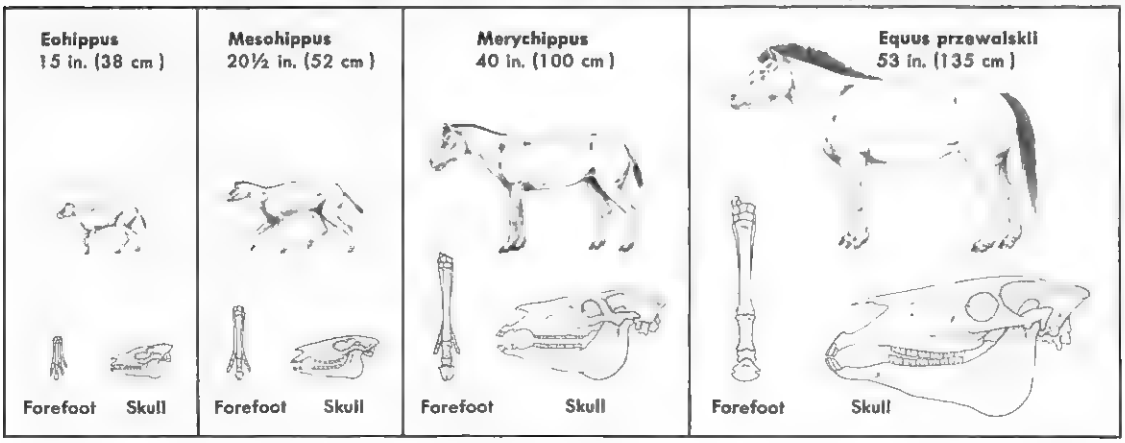
Stone tablets show that the Hittites trained horses for sport and war about 1400 B.C. The Assyrians, about 800 B.C., hunted lions in two-wheeled chariots drawn by a pair of horses. Tapestries show early Persians playing a kind of polo. The early Greeks and Romans were expert riders and used horses for racing and other sports. Greek and Roman soldiers rode horses in battle. The Greeks wrote about horsemanship as early as 400 B.C. We still follow their principles of riding.

In 1066, William the Conqueror used mounted knights to invade England. The English then began to

The Development of the Horse

The illustrations below show some of the ancestors of the modern horse. The earliest ancestor, *Eohippus*, lived about 55 million years ago. Various horselike creatures gradually developed over millions of years, changing in size and other body features. For example, the many-toed feet of early horses developed into the single-toed hoofs of today's horses.

WORLD BOOK illustrations by Jean Helmer and Patricia J. Wynne



The Metropolitan Museum of Art, Gift of John D. Rockefeller, Jr., 1933

Ornamented Horses are led by a man paying tribute to his king. This piece of wall relief of the 700's B.C. comes from the palace of the ancient Assyrian ruler Sargon II, near Mosul, Iraq.

Famous Horses in History and Legend

Al Borak carried Muhammad from the earth to the seventh heaven, according to Muslim legend.

Aristides won the first Kentucky Derby in 1875.

Black Horse, from the Bible (*Revelation*), is the horse of Famine.

Bucephalus could be ridden only by Alexander the Great, who founded the city of Bucephala about 326 B.C. in honor of his beloved horse.

Bulle Rock was the first Thoroughbred imported from England to America, in 1730.

Cincinnati, a great black charger, carried General Ulysses S. Grant during the Civil War.

Clever Hans, who lived in the early 1900's, was a famous "talking" horse that solved arithmetic problems.

Comanche, a cavalry horse, was the only survivor of General George A. Custer's "last stand" in 1876. **Vic,** Custer's horse, was killed in the battle.

Copenhagen carried the Duke of Wellington to victory in the Battle of Waterloo in 1815.

Diomed won the first English Derby at Epsom Downs, in 1780.

Eclipse, an English Thoroughbred foaled in 1764, was the ancestor of many modern Thoroughbreds.

Incitatus was made a priest and consul by the Roman Emperor Caligula about A.D. 40. This horse had an ivory manger and drank wine from a golden pail.

Iroquois, in 1881, became the first American-bred horse to win the English Derby.

Marengo, a white stallion, was ridden by Napoleon in his defeat at Waterloo in 1815.

Pegasus was the great winged horse of the Muses (nine goddesses in Greek mythology). See PEGASUS.

Reckless, a small Korean racing mare, served as ammunition carrier for a U.S. Marine platoon during the Korean War (1950-1953). The mare was made a sergeant and received a medal for bravery under fire.

Sleipnir, the gray horse of Odin, chief god in Norse mythology, was said to have eight legs and be able to travel on land or sea.

Traveller, a spirited gray gelding, carried General Robert E. Lee during the Civil War. See LEE, ROBERT E. (picture).

Trojan Horse, a large wooden horse built by the Greeks, helped them capture the city of Troy during the Trojan War, about 1200 B.C. See TROJAN WAR.

Xanthus was the horse of Achilles. He was supposed to have predicted his master's death, after being scolded by the mighty Greek warrior.

breed large, powerful war horses that could carry a man wearing a heavy suit of armor. During the 1300's, after armies began using gunpowder, swift, light steeds replaced the large mounts of the knights as war horses.

Horses in Early America. The first European colonists found no horses in North America. The American Indians did not know about horses until Spanish conquerors brought them to Mexico in 1519. The Spaniards and later explorers left some of their horses behind. The Spanish horses probably became the ancestors of the American wild horses.

The Indians, especially the tribes of the western plains, began to use horses about 1600. Indians rode horses to hunt buffalo and used them in battle.

Horses played an important part in the development and exploration of North America. The pioneers who settled the West rode horses and used them to pull their covered wagons. Mounted soldiers fought in the Revolutionary War and in the Civil War.

Horses pulled trains on several short railroads until the steam locomotive replaced them about 1830. They also pulled *horsecars* (streetcars) in cities before electricity was used. Stagecoaches and the pony express served as the fastest means of communication until the telegraph linked the East and West coasts in 1861.

Horses in the 1900's. With the development of railroads, tractors, trucks, and automobiles, horses became less useful. Horse-drawn milk wagons were replaced by milk trucks. Garbage trucks took the place of horse-drawn open wagons. During World War II (1939-1945), the U.S. Army gave up cavalry horses.

The Metropolitan Museum of Art, New York, Fletcher Fund, 1919

A European War Horse was large and strong enough to carry a heavily armored knight into battle. This print by Albrecht Dürer, a German artist, dates from the early A.D. 1500's.

Bettmann Archive

Automobiles Began to Replace Horse-Drawn Carriages during the early 1900's. Horses lost importance in transportation as the use of motor-driven vehicles became widespread.

The number of horses on United States farms declined steadily as more and more farmers began to use machinery. American farmers owned about 20 million farm horses in 1910. By the mid-1970's, there were only about 9 million horses in the United States. But, though the use of horses for heavy work declined, their importance in sports and recreation increased.

Several million wild horses roamed parts of the American West during the 1800's. The number declined to less than 20,000 by the early 1970's. Many people feared the horses were becoming extinct, especially because the horses were being hunted to obtain meat used in pet food. In 1971, the United States Congress passed a law that protects American wild horses.

Scientific Classification. Horses belong to the horse family, Equidae. They are classified as genus *Equus*, species *E. caballus*.

STEVEN D. PRICE and BILL LANDSMAN

HORSE / *Study Aids*

Related Articles in WORLD BOOK include:

KINDS OF HORSES

Bronco, Mustang, Przewalski's Horse, Shetland Pony, Tarpan

MEMBERS OF THE HORSE FAMILY

Donkey, Mule, Onager, Zebra

DISEASES OF HORSES

Distemper, Glanders, Heaves, Mange, Spavin

SPORTS

Fox Hunt, Harness Racing, Horse Racing, Kentucky Derby, Olympic Games (table: Equestrian), Polo, Rodeo, Steeplechasing

OTHER RELATED ARTICLES

Adaptation (Adaptation of a Population), Animal (Intelligence of Animals), Bonheur, Rosa (picture), Botfly, Brain (picture: Comparing Brain Weights), Centaur, Cowboy, Harness, Hoof, Horsefly, Kentucky (pictures), Pegasus, Saddle, Ungulate, Wyoming (pictures)

Outline

Questions

What does a *hand* mean in measuring a horse?
What are the three kinds of equestrian sports in the Olympic Games?
What are the horse's three natural gaits?
Why do horses need salt in their diet?
What did the earliest known ancestor of the horse look like?
How do you start and stop a horse when riding?
Why do owners sometimes cover horses with blankets?
How many teeth does a full-grown horse have?
What are the *aids* or *cues*? How are they used?
Which are the strongest horses?

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HORSE AND BUGGY. See BUGGY.

HORSE BEAN is a hardy annual plant that may grow 6 feet (1.8 meters) high. It is an important food crop in Latin America. It is sometimes called the *bean of history* because it was an important food to the early civilizations of northern Africa and southwestern Asia, where it grows wild. It is also called the *windsor bean* and the *broad bean*. Its white flowers are spotted with purple. Its pods may be 1 foot (30 centimeters) long. They contain thick beans, or seeds, that sometimes are 1 inch (2.5 centimeters) wide. See also BEAN.

Scientific Classification. The horse bean belongs to the pea family, *Leguminosae*. It is classified as genus *Vicia*, species *faba*. S. H. WITTWER

HORSE BRIER. See GREENBRIER.

HORSE CHESTNUT is any one of a group of trees and shrubs that are often planted for their showy flowers and handsome leaves, and for shade. There are about 25 species in North America, Europe, and Asia, including seven that are native to the United States. They are not related to chestnuts (see CHESTNUT). The large, shiny brown seeds resemble chestnuts, but are bitter and poisonous. A spiny covering, or *capsule*, encloses one or two seeds. The trees have paired leaves. Each leaf has five or seven pointed and toothed leaflets that spread like fingers from the end of the long leafstalk.

The common horse chestnut of Europe is a favorite tree for streets and parks. Its large seeds have a scar that resembles a horse's hoof.

The native American trees are called *buckeyes*, because their seeds have a light brown scar that resembles the partly opened eye of a buck, or deer. *Ohio buckeye*, or *fetid buckeye*, which grows in the Ohio and Mississippi valleys, gave Ohio the name *Buckeye State*, and is the state tree (see OHIO [color picture: The State Tree]). The *yellow buckeye* grows in the Ohio Valley and the Appalachian Mountains. Its soft, light, whitish wood is used for furniture, boxes and crates, and artificial limbs.

American Indians prepared the starchy buckeye seeds for food by roasting and washing them thoroughly to remove the poison. They made a powder of the raw seeds and threw it into water to stupefy fish.

Scientific Classification. Horse chestnuts belong to the horse chestnut family, *Hippocastanaceae*. They make up the genus *Aesculus*. The European horse chestnut is species *hippocastanum*. Ohio buckeye is *A. glabra*. Yellow buckeye is *A. octandra*. ELBERT L. LITTLE, JR.

See also TREE (Familiar Broadleaf and Needleleaf Trees [picture]).

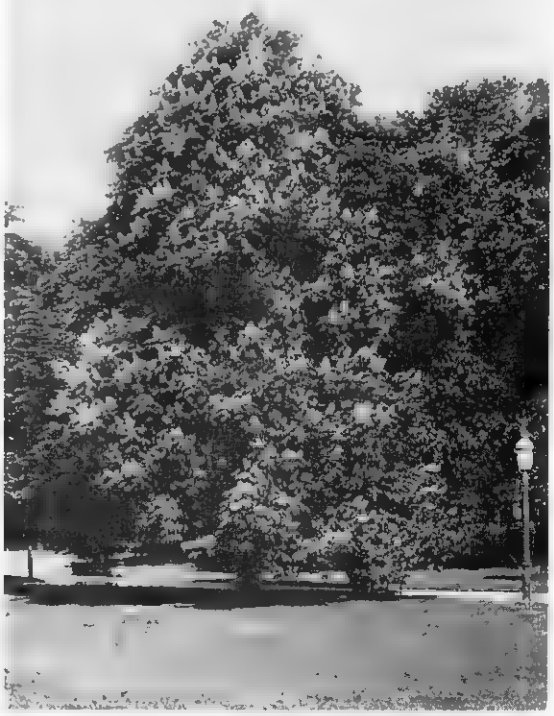
HORSE FARMS. See KENTUCKY (Places to Visit).

HORSE LATITUDES are regions noted for their lack of winds. Two belts of calm air extend around the earth at about 30° north and south latitude. The regions may have received their name because many horses died on ships delayed there by the lack of wind. Or the name may have come from a Spanish sailing term that called the winds there unpredictable, supposedly like a female horse. The horse latitudes lie between the belts of the trade winds and the prevailing westerlies. The name also is given to belts of light rainfall at about 25° north and 30° south latitude. SIGISMOND DER. DIETTRICH

HORSE NETTLE. See SOLANUM.

The European Horse Chestnut bears spikes of tiny white flowers in May. The thick branches make it a good shade tree.

L. W. Brownell



Spiny Coverings enclose the large brown seeds, *right*, of the horse chestnut. The dark green leaves and beautiful white flowers, *below*, of the horse chestnut tree make it a favorite for planting in parks and along streets.

Brownell; U.S. Forest Service

Race Horses gallop down the home stretch toward the finish line as the jockeys maneuver for position. Thousands of excited racing fans cheer for their favorites.

HORSE RACING is a popular sport based on the speed of horses and the skill of jockeys. Horse races have been held since ancient times, and millions of people throughout the world enjoy them today. Racing fans thrill to the sight of colorfully dressed jockeys on sleek horses galloping around a track toward the finish line. In the United States, more people attend horse races than any other type of sports event.

One of the features of horse racing is the chance to win money by betting on horses to finish first, second, or third in a race. People wager billions of dollars on horse races yearly.

Races in which jockeys ride horses around a flat track are called *flat races*. There are two other kinds of horse races—*harness races* and *steeplechases*. In a harness race, each horse pulls a driver in a two-wheeled carriage called a *sulky*. In a steeplechase, horses ridden by jockeys race over obstacles. This article discusses flat races. For information on harness races and steeplechases, see the World Book articles on Harness Racing and Steeplechasing.

Race Horses

Most race horses are *thoroughbreds*—that is, horses whose ancestry can be traced back to any of three Arabian stallions. One of these stallions, named the Byerly Turk, was taken to England in the late 1600's. The other two, called the Darley Arabian and the Godolphin Barb, were taken there in the early 1700's. Arabian horses are known for their speed, and these three stallions were carefully bred with English mares to produce swift, strong race horses.

Thoroughbreds weigh from 1,000 to 1,200 pounds (450 to 544 kilograms). They stand from 62 to 65 inches (157 to 165 centimeters) tall from the ground to the *withers*, the highest part of a horse's back.

Thoroughbreds are not allowed to race until they are 2 years old. In the Northern Hemisphere, the age of a thoroughbred is automatically figured from January 1 of the year in which it is born. Thus, all thoroughbreds born during the same year have the same birthday. This method of determining age simplifies the basic grouping of race horses according to age. Most thoroughbreds that race are 2, 3, 4, or 5 years old. Breeding programs are planned so that the horses are born in the first few months of the year. In the Southern Hemisphere, a thoroughbred's age is figured from August 1.

Various terms are used to classify thoroughbreds according to age and sex. A newborn thoroughbred is called a *foal* until its first birthday, when it becomes a *yearling*. A male is a *colt* from its second birthday until it reaches the age of 5. It is then called a *horse*. A female is a *filly* from the age of 2 until the age of 5, when it becomes a *mare*. A male parent is a *sire*, and a female parent is a *dam*. A male horse that has been castrated is called a *gelding*.

Jockeys

Jockeys control the horses in a race. The skill of a jockey in handling a horse can determine whether the horse wins the race.

Horses are required to carry a certain weight in races. A jockey must be light in weight because the weight the horses are assigned to carry includes that of the rider. Most jockeys weigh about 110 pounds (50 kilograms).

A jockey's equipment includes a saddle, a whip, boots, a crash helmet, and a special jacket and cap. The jacket and cap, which are called *silks*, are provided by the owner of the horse. The colors and the arrangement of the colors of silks identify the owner. Each owner's silks differ from those of other owners. Silks are also called *colors*.

In the United States, all jockeys are licensed by state racing commissions. Jockeys begin their careers as apprentices. Apprentice jockeys receive weight *allowances*

in races. The usual allowance is five pounds, though the amount varies among states. For example, a horse assigned to carry 115 pounds would carry only 110 pounds if ridden by an apprentice.

At the Races

Types of Horse Races. Most horse races are run over distances ranging from $\frac{5}{8}$ mile to $1\frac{1}{2}$ miles (1.2 to 2.4 kilometers). The distances of horse races are also expressed in units called *furlongs*. A furlong equals $\frac{1}{8}$ mile (201 meters).

The owners of the horses that finish first, second, third, and fourth in a race receive prize money. This money, called the *purse*, is put up by the race track. In the case of *stakes races*, also called *sweepstakes races*, fees paid by horse owners are added to the purse. The owner of the winning horse gets most of the purse. But the owners of at least the next three finishers also receive shares. Most famous horse races are stakes races. For example, the best-known horse races in the United States—the Kentucky Derby, the Preakness, and the Belmont Stakes—are stakes races. These three annual events form the *Triple Crown* of horse racing. Other famous races include the Epsom Derby in Great Britain, the Irish Sweeps Derby in Ireland, and the Melbourne Cup in Australia. All are stakes races.

There are several classes of horse races. Some races are restricted to horses of a certain ability. Others are open only to horses of the same age or sex. Most races in the United States are *claiming races*, in which horses of about the same value run against one another. Each horse that competes can be bought for a specific price by any owner who had an entry in the race, or, in some states, by any licensed owner. Claiming races assure that thoroughbreds run against horses of similar ability. If the owner of a fast, high-priced horse enters it in a race against slower, lower-priced ones, another owner will claim the animal.

In a *handicap race*, the amount of weight the horses are assigned to carry depends on their speed. Faster horses are required to carry more weight than slower ones to provide better competition. Weight is added by inserting flat lead weights into pockets in a piece of cloth called a *lead pad*. The pad is placed on the back of the horse, under the saddle. An *allowance race* is a special kind of handicap race. Allowance races are open only to horses that have won a certain number of races or a certain amount of money. A *maiden race* features horses that have never won a race.

The Race Track. Major race tracks have both dirt and *turf* (grass) courses. Most U.S. horse races are run on dirt courses. These courses are flat and oval and consist of several layers of crushed rock, sand, and dirt. They are designed to provide a fast racing surface.

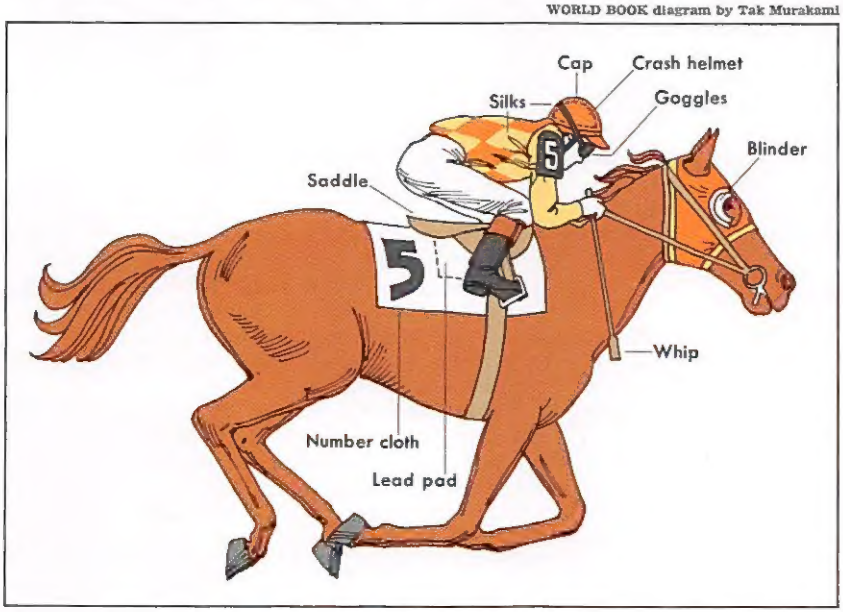
At most major race tracks, the dirt course surrounds the turf course and is 1 mile (1.6 kilometers) long. A fence called the *rail* separates the two courses. An area known as the *infield* lies within the turf course. An electronic *totalizator board*, or *tote board*, stands in the infield. This device displays such information as the odds on the horses and the official results of the races.

Many racing fans watch horse races from the grandstand. This structure extends along the *home stretch*, the part of the track that ends with the finish line.

Betting. The major race tracks in the United States use the *pari-mutuel* system of betting. In this system, all the money wagered on horses to win a race is combined in a fund called a *pool*. The odds are based on the proportion of the amount of money in the pool to the amount bet on each horse. The horse on which the most money is wagered is the *favorite*. Horses with little backing are called *long shots*. The odds on a favorite may be 3 to 1, but the odds on a long shot may be 20 to 1. Such odds mean that if the favorite wins, people receive $3 for every $1 that they bet on it to win. If the long shot wins, they receive $20 for every $1.

Most of the money in the pool is divided among the people who bet on the winning horse. The race track,

WORLD BOOK diagram by Tak Murakami



A Jockey's Equipment includes a saddle, whip, boots, goggles, a crash helmet, and a jacket and cap. The jacket and cap, called *silks*, identify the horse's owner by their colors and arrangement of colors. The horse wears blinders and an identification number.

the state, and the owner of the winning horse also receive a certain percentage of the pool.

The minimum wager is $2. A person wagers on a horse to *win*, *place* (finish second), or *show* (finish third) by purchasing one of three major types of tickets. The owner of a win ticket collects only if the horse wins the race. A person with a place ticket wins if the horse finishes first or second. People who purchase show tickets collect if the horse runs first, second, or third. Usually, a win ticket pays the most money, and a show ticket pays the least. Special types of bets include the *daily double* and the *trifecta*. In the daily double, a person tries to select the winners of two specified consecutive races. In the trifecta, a bettor tries to pick the first-, second-, and third-place horses in a specified race.

Betting on horse races at places other than race tracks is legal in only three states—Connecticut, Nevada, and New York. In those states, such *off-track betting* is closely supervised by the state government.

A system of betting called *bookmaking* is legal in Nevada and in Australia, Great Britain, and Ireland. People called *bookmakers* set the odds and accept bets. Bookmakers try to set odds that enable them to make a profit after paying the winning bettors.

"They're Off!" Before a race, the jockeys are weighed with their equipment. This *weighing out* procedure is supervised by a track official called the *clerk of the scales*. The weight of each rider and the equipment must match the weight assigned to the jockey's horse.

About 30 minutes before a race, the horses are taken to the *paddock*, a fenced-in area where they are saddled. The jockeys then go to the paddock and, on a signal from an official called the *paddock judge*, they mount their horses. The horses parade past the grandstand and enter their assigned stalls in the starting gate. Another official, the *starter*, presses a button. A bell rings and all the stall doors open at the same instant. The horses lunge from the gate, and the track announcer shouts, "They're off!" Several times during a race, the announcer tells the crowd the position of each horse.

Officials called *stewards* may disqualify a horse and change the results of a race if they spot any rule violations. Immediately after a race, to make sure the horses have not been drugged or received illegal medication, urine tests are performed on the winner and others chosen at random. In addition, the jockeys and their equipment are weighed again to confirm that the horses carried the correct weight.

History

Early Horse Racing. Horse racing probably began about the time that horses were first domesticated. The earliest records of horse races date back to about 1500 B.C., when chariot races were held in eastern Europe and northern Africa. The Olympic Games in ancient Greece first featured chariot races in 680 B.C. Races between horses with riders were added to the games in 648 B.C. Horse racing later spread to what became Asia Minor, France, Germany, India, and Italy.

The Romans, who controlled what is now Great Britain from the A.D. 40's to the early 400's, introduced horse racing there. Through the centuries, English monarchs and members of the nobility owned race horses. As a result, horse racing is sometimes called the *sport of kings*. King James I established a racing center at Newmarket, England, near Haverhill, and races began to be held there about 1619. Newmarket is still a center of horse racing today.

Many people who came to America from Europe during the 1600's brought horses with them. They raced the animals on flat, straight courses. The first American race track, called New Market, was established in 1665. It lay near what is now Elmont, N.Y., the site of the Belmont Park race track.

The Growth of Racing. Pari-mutuel betting was developed during the late 1800's by Pierre Oller, the owner of a French perfume shop. In the 1890's, the American jockey Tod Sloan introduced the crouch position for riding. American jockeys still use this position, in which the rider leans forward over the horse's neck. Previously, jockeys had sat upright, which is the European style.

Most of the famous stakes races were established from the late 1700's to the late 1800's. In England, the St. Leger Stakes was first held in 1776. It is one of the five "classics" of English racing. The others, and the year they were first run, are the Oaks, 1779; the Epsom Derby, 1780; the 2,000 Guineas, 1809; and the 1,000 Guineas, 1814. The most famous Australian race, the Melbourne Cup, was established in 1861. The Grand Prix de Paris was first held in 1863 in France, and the Irish Sweeps Derby in Ireland in 1866.

The top Canadian horse race, the Queen's Plate, began in 1860. This race is the oldest continually run stakes race in North America. In the United States, the Belmont Stakes was first held in 1867, followed by the Preakness in 1873 and the Kentucky Derby in 1875.

In 1894, American racing leaders formed the Jockey Club to regulate the sport in the United States and supervise the registration of thoroughbreds. The Jockey Club works with the state racing commissions and ranks as the nation's central authority for horse racing.

Perhaps the most famous American race horse was Man o' War. In 1919 and 1920, Man o' War won 20 of 21 races. In 1919, Sir Barton became the first horse to win the Triple Crown. Citation, a Triple Crown winner in 1948, was the first horse to win $1 million. Kelso, the top race horse of the early 1960's, won more money than any other thoroughbred—$1,977,896.

Leading American jockeys of the 1900's include Eddie Arcaro, Bill Hartack, Johnny Longden, and Willie Shoemaker. Arcaro and Hartack were the only jockeys to ride five winners in the Kentucky Derby. Shoemaker won more than 7,000 races, and Longden won more than 6,000. Sir Gordon Richards of Great Britain won 4,970 races and was the first jockey to be knighted. Lester Piggott was the top British jockey of the 1960's and 1970's.

Racing Today. On Feb. 7, 1969, Diane Crump became the first woman jockey to ride in a race on a major American track. Many other women jockeys competed in the 1970's, including Mary Bacon and Robyn Smith.

Many racing fans consider Secretariat the greatest horse in American racing history. Secretariat raced in 1972 and 1973 only, but he won $860,404 in 1973, a one-year record. He also won the Triple Crown in 1973.

In 1977, a 17-year-old apprentice jockey named Steve

Cauthen rode 488 winners and won $6,151,750 in purses. Cauthen was the first jockey to earn more than $5 million in one year. In 1978, Affirmed, ridden by Cauthen, won the Triple Crown. ANTHONY CHAMBLIN

Related Articles in WORLD BOOK include:

Arcaro, Eddie
Derby
Grand National
Hialeah Park
Hippodrome
Horse
Kentucky Derby
Racing (Horse Racing)
Sande, Earl
Shoemaker, Willie

HORSE SHOW. See HORSE (Horse Shows).

HORSEBACK RIDING. See HORSE (How to Ride; pictures).

HORSECAR. See STREETCAR (with picture).

HORSEFLY, or GADFLY, is a type of fly that bites horses and other animals and sucks their blood. The name is generally applied to a black fly that lives near inland ponds, roadside ditches, and streams in the United States and Canada. Female horseflies lay their eggs in clusters, usually on plants that grow in wet ground, or overhang water. The *larvae* (young flies) live in the debris and mud along ditches, swamps, and rice fields, and eat earthworms and other soft creatures. The horsefly annoys animals. It pricks the skin of the animal and its *proboscis* becomes soiled with the animal's blood. It carries infections such as *anthrax* and *tularemia*. It is difficult to control horseflies, but oil sprays have been used successfully against adult flies. Pyrethrum sprays also drive them away. Both sprays kill the insects on contact.

USDA

Adult Horsefly

Scientific Classification. The horsefly belongs to the family *Tabanidae*. The black horsefly is genus *Tabanas*, species *T. atratus*. ROBERT L. USINGER

See also FLY (with picture: Horsefly's Eyes).

HORSEFOOT. See KING CRAB.

HORSEHAIR. See HAIRCLOTH; UPHOLSTERY (Stuffing).

HORSEHAIR SNAKE. See HAIR SNAKE.

HORSEHEAL. See ELECAMPANE.

HORSEMANSHIP. See HORSE (How to Ride).

HORSEPOWER is a unit used to express the *power* (rate of doing work) of an engine in the customary system of measurements. The term *horsepower* was first used by the Scottish engineer James Watt. He used it to compare the power of steam engines to the power of horses (see WATT, JAMES). Today, this term is used to express the power of such devices as automobile engines, jet engines, electric motors, and atomic reactors. One horsepower is defined as 550 foot-pounds of work per second, or 33,000 foot-pounds of work per minute. One *foot-pound* is the work needed to lift one pound one foot. The metric unit of power is the *watt*. One horsepower equals 745.7 watts. See FOOT-POUND; WATT.

If an engine lifts a 550-pound object to a height of 2 feet in 1 second, it is working at a rate of 1,100 foot-pounds per second ($550 \times 2 \div 1 = 1{,}100$). This engine is delivering 2 horsepower ($1{,}100 \div 550 = 2$). If a 150-pound man climbs to a height of 88 feet, he does 13,200 foot-pounds of work ($150 \times 88 = 13{,}200$). If the man makes this climb in 1 minute (60 seconds), he is working at a rate of $\frac{4}{10}$ horsepower ($13{,}200 \div 60 = 220$; $220 \div 550 = \frac{4}{10}$). A person who is accustomed to hard work can work at a rate between $\frac{1}{10}$ and $\frac{1}{8}$ horsepower continuously during an 8-hour day.

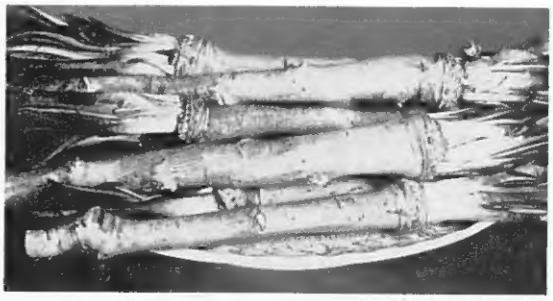
The power of an engine can be measured in various ways. These are (1) indicated horsepower, (2) brake horsepower, and (3) S.A.E. horsepower.

Indicated Horsepower is a measurement of the power produced inside the cylinders of an engine. The power in foot-pounds per minute is first calculated by multiplying together the average pressure on the pistons, the area of each piston, the length of the piston's stroke, the number of power strokes per minute, and the number of cylinders in the engine. This power must be divided by 33,000 to give the engine's indicated horsepower.

Brake Horsepower is sometimes called *effective horsepower*, because it is the amount of power available at the engine's shaft. Brake horsepower is measured by an instrument called a *dynamometer*. This instrument measures the engine's speed and the *torque* (amount of twist) exerted by its shaft. Brake horsepower is the rating most widely used by engineers. It is lower than indicated horsepower because friction in the engine wastes part of the power produced in the cylinders.

S.A.E. Horsepower is a calculated rating approved by the Society of Automotive Engineers (S.A.E.). Its most important use is in determining the licensing fees for automobiles in some states. The formula used to calculate S.A.E. horsepower is not exact, and it is rarely used by engineers. ROBERT L. WEBER

See also AIR CONDITIONING (Capacity of Air Conditioners); AUTOMOBILE (table: Interesting Facts About Automobiles).



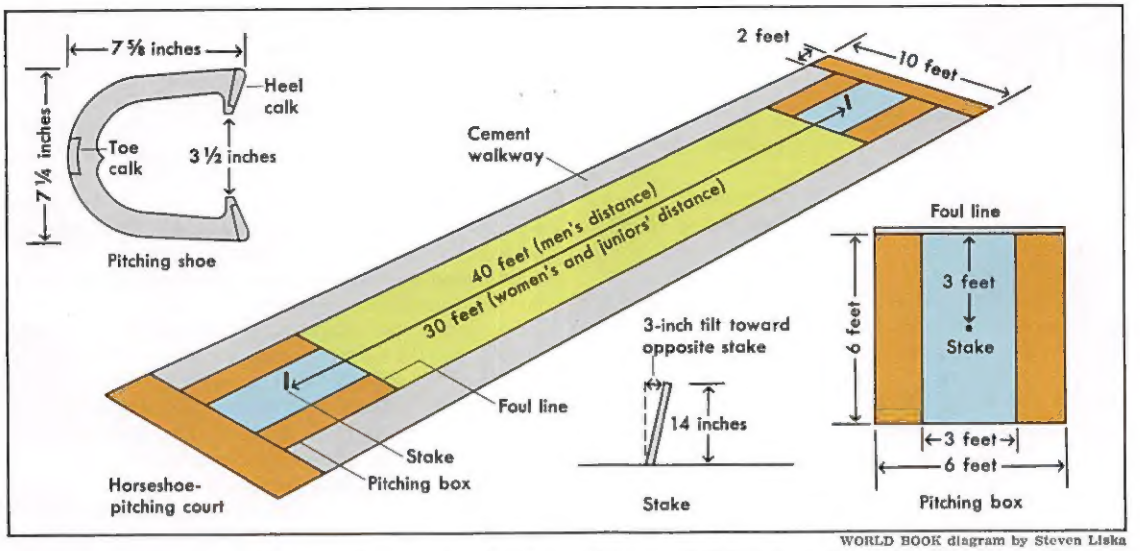
J. Horace McFarland

The Roots of the Horseradish Have a Biting Taste.

HORSERADISH is an herb whose root is used to make a pungent food relish. The plant is native to Europe. It has many long leaves and a large root. People grate the root to prepare it for use. They preserve the grated pieces in vinegar to prevent loss of the pungent, volatile compound that gives horseradish its biting taste. The root retains its pungency until it is ground. Whole roots will remain pungent for long periods.

When workers harvest horseradish, they remove the side roots. These roots are used for the following year's

Horseshoe Pitching Horseshoe pitching is played on a rectangular court that has a stake set in a pitching box at each end. Players stand behind a foul line at one end of the court and pitch two horseshoes at the stake at the other end. The diagram below shows the dimensions of a regulation court and a horseshoe.



WORLD BOOK diagram by Steven Liska

crop. Farmers cut the side roots for planting in the spring.

Scientific Classification. Horseradish belongs to the mustard family, *Cruciferae*. It is genus *Armoracia*, species *A. rusticana*. JOHN H. MACGILLIVRAY

HORSESHOE. See HORSE (Shoes); SUPERSTITION (Kinds of Superstitions).

HORSESHOE BEND, BATTLE OF. See INDIAN WARS (In the South); JACKSON, ANDREW (The Battle of Horseshoe Bend).

HORSESHOE BEND NATIONAL MILITARY PARK. See NATIONAL PARK SYSTEM (table).

HORSESHOE CRAB. See KING CRAB.

HORSESHOE FALLS. See NIAGARA FALLS AND NIAGARA RIVER (Falls); ONTARIO (picture: Niagara Falls).

HORSESHOE PITCHING is a game played by throwing horseshoes at a stake. Two, three, or four persons can play at a time. Players score points by getting the horseshoes close to or around the stake.

Rules. Regulation horseshoes are flat, U-shaped pieces of iron with a *calk* (small toe) at the closed end and at each tip. A shoe may not be more than $7\frac{1}{4}$ inches (18.4 centimeters) wide and $7\frac{5}{8}$ inches (19.4 centimeters) long. It must not weigh over 2 pounds 10 ounces (1.2 kilograms), and it must have no more than $3\frac{1}{2}$ inches (8.9 centimeters) of space between the calks at the open end.

A *pitching court* is about 10 feet (3 meters) wide and about 50 feet (15 meters) long. Within this area, two steel or iron stakes 1 inch (2.5 centimeters) in diameter are driven or anchored into the ground 40 feet (12 meters) apart. Each stake stands 14 inches (36 centimeters) high in a *pitching box* that is 6 feet (1.8 meters) square. Each pitching box has an area of clay, soil, or sand, in which the horseshoes land.

If two or three persons play a game, they compete individually. If four play, two persons make up each team. Players take turns throwing the horseshoes. A player throws two shoes each turn. Men pitch from a distance of 40 feet from the stake. Women and juniors (players under age 17) throw from a distance of 30 feet (9 meters). Players pitch horseshoes with an underhand motion. Fingertip control gives the shoe a flip or turn so the open end faces the stake as the shoe lands.

Scoring. A *ringer* is a shoe that encircles the stake so that a straight edge can touch both tips of the shoe without touching the stake. A ringer scores 3 points. A shoe that comes to rest within 6 inches (15 centimeters) of the stake scores 1 point. A *leaner* (a shoe that leans against the stake) is also worth 1 point. There are two main systems of scoring horseshoe pitching contests, *cancellation* and *count-all*. In cancellation, a game usually consists of 50 points. If opposing players throw ringers or shoes that land equally close to the stake, the shoes cancel each other. Points are scored by counting the ringer or shoe closest to the stake that is not tied by the opposing player. A count-all game normally consists of *25 innings* (50 shoes thrown by each player). In a count-all game, all ringers and horseshoes within 6 inches of the stake are scored according to their point values.

History. Horseshoe pitching originated in Roman army camps about A.D. 100. The game has long been popular in the United States and Canada, but for many years it had no set rules. In 1914, a group of men set up standards of play and equipment, and the popularity of the game increased. The National Horseshoe Pitchers' Association of America, incorporated in 1920, developed from this group. The association has headquarters at Route 5, Lucasville, Ohio, 45648. The Canadian Horseshoe Pitching Association, incorporated in 1929, has headquarters at 35 O'Neil Crescent, Saskatoon, Saskatchewan, S7N 1W7. JACK ADAMS

HORSETAIL, or SCOURING RUSH, is a rushlike plant with a hollow, grooved, and jointed stem. All parts of the plant contain silica, an abrasive material (see SILICA). The horsetail is sometimes called *scouring rush* because it was once used to polish metal.